Cervical Cancer Screening Intention Among Health Care Professionals Working at the College of Health Sciences of Addis Ababa University: Applying Psychometrically Tested Health Belief Model Informed b

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Dissertation for the Degree of Doctor of Philosophy (PhD) in Nursing Addis Ababa University-Emory University PhD Collaboration Program, Addis Ababa, Ethiopia

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A dissertation submitted to the School of Graduate studies of Addis Ababa University in partial fulfillment of the requirements for the Degree of Doctor of Philosophy (PhD) in Nursing

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Abbreviations

AAU	Addis Ababa University
AOR	Adjusted Odds Ratio
AUC	Area under curve
CCS	Cervical Cancer Screening
COR	Crude Odds Ratio
EDHS	Ethiopian Demographic Health Survey
HBM	Health Belief Model
HCP	Health care professionals
HPV	Human Papilloma virus
LMICs	Low- and Middle-Income Countries
OR	Odds Ratio
PAF	Principal Axis Factoring
PAP	Papanicolaou Smear Test
ROC	Receiving operating characteristics
SPSS	Statistical Package for Social Sciences
SSA	Sub Sharan Africa
STD	Sexually transmitted disease
STI	Sexually transmitted infections
TNM	Trans- theoretical model
TASH	Tikur Anbessa Specialized Hospital
USA	United States of America
VIA	Visual Inspection with Acetic Acid
WHO	World Health Organization

Abstract

Background: Screening for cervical cancer at least once between the ages of 30-40, lowers the risk of cervical cancer in women by 25–36%. In Ethiopia, over 27 million women are at risk for cervical cancer yet cervical screening occurs in less than 1 % of women. Even when cervical cancer (CC) screening is available in LMICs free of charge various studies have shown, that women eligible for screening have an even lower participation rate. Understanding of the knowledge and health beliefs that influence CC screening and participation behaviors among women, are essential in order to increase demand for screening of CC. Several theoretical perspectives could be used to explore the determinants of the healthcare professionals' behaviors to this end. Some behaviors and beliefs may have a significant impact on the females' decision to take preventive actions against cervical cancer. It is well documented that intention to cervical cancer screening predicts actual attendance however as intention is volatile with time, we used the Trans-Theoretical Model (TTM) to determine the stages of change and intention of cervical cancer screening. Evidence supports that Health Belief Model (HBM) explains and predicts certain health behaviors, including CC screening. Healthcare providers can serve as role models to facilitate a supportive environment that encourages women to utilize screening for cervical cancer. An understanding of factors that predict cervical cancer screening behaviors may contribute to the development of more effective screening. Studies using the Health Belief Model (HBM) to explain women's screening behaviors have been inconsistent and psychometric properties of the modified health belief model tool was not validated among population under study. In addition, in Ethiopia studies evaluating the predictability of the HBM towards intention to screen for cervical cancer are very limited.

Objective: This study aims to test psychometric properties of the HBM, assess the intention of screening with visual inspection with acetic acid (VIA) and its determinants among female healthcare professionals (HCPs). The conceptual frame work guiding the study are TTM and HBM to determine the intention to screen for cervical cancer.

Method: We conducted a cross-sectional study in Addis Ababa Ethiopia at the College of Health Sciences (CHS), Addis Ababa University (AAU). Health care professionals aged 30 and above years at AAU-CHS were the study population. For cervical cancer to develop in a woman less than 30 years of age is rare and the Federal Ministry of Health of Ethiopia supports implementing VIA testing starting age 30. A sample size of 210 health care professionals was used for psychometric testing of the modified HBM scale. A larger sample of 484 participants were enrolled to examine the intention of cervical cancer screening and factors associated with

screening behavior using the trans-theoretical model and HBM predictability of intention among health care professionals working at the CHS, AAU. The analysis included factor analysis, logistic regression and ROC curve analysis.

Result: A total of 194 female health care professionals, with mean age 30±4.34 were used for the final analysis in psychometric testing of the 42 items of the HBM. Twelve items removed with ≤ 0.5 loading. The retained 30 items were loaded into 6 factors; benefits of VIA, perceived seriousness of CC, barrier (fear of negative outcome), self-efficacy, susceptibility to CC, and barriers (health system delivery) explained 65% of the total variance. Cronbach's alpha for the total instrument was 0.8 and reliability for the 6 subscales ranged 0.76–0.92. Composite reliability and AVE indicated good internal consistency and convergent validity. CFA identified 6 additional items to be removed with high residual covariance. The final 24 items of the modified HBM had an acceptable model fit (GFI= 0.861, AGFI= 0.823, CFI= 0.937, RMSEA=0.059). Intention of health care professionals to participate in cervical cancer screening was 44.1%. Over half 52% of the participants had poor knowledge of cervical cancer and screening. Regarding the TTM stages of change, 46.5% participants indicated being at the pre-contemplation phase suggesting they never had a VIA screen and had no intention being screened within the next six months. In the final logistic regression model age; in the 30-34- and 35-39-years age ($p<0.05$), participants who took care of patient with cervical cancer ($p<0.01$), being screened in the past three years ($p<0.01$) and good and moderate knowledge ($p<0.05$) had statistically significant association with CC screening. Perceived benefit, barrier to fear of negative outcome, barrier to health delivery, perceived seriousness and self-efficacy were significantly associated with intention to screen for cervical cancer with p-value <0.05. The ability of the HBM model to predict intention to screen for cervical cancer was acceptable (AUC 0.742) for perceived seriousness and poor identifying ability for perceived benefit and self-efficacy (AUC of 0.579 and 0.697) respectively. In addition, the ability of the model to predict having no intention to screen for cervical cancer were acceptable for perceived barrier to fear of negative outcomes and perceived barrier to health delivery with AUC of 0.745 and 0.715 respectively.

Conclusion and recommendation: The findings revealed that the modified HBM for CC and VIA with 24 items had adequate psychometric properties; most of the participants were at the pre-contemplation phase and the limited knowledge among female health care professionals had about cervical cancer screening is a concern and merits further investigation on the reasons for the poor knowledge. This study supports the use of constructs of the modified HBM for predicting intention to screen for cervical cancer with VIA among female HCPs in Ethiopia. Our finding suggests the validated tool may be used by Ethiopian health care professionals for

research or clinical purposes. To support external validity of the updated 24 items tool is suggested to further study in different populations in Ethiopia that may contribute to the development of targeted interventions to promote screening uptake in LMICs. Intervening on the factors that affect intention for screening is vital to reduce barriers to cervical screening among female HCPs as well the broader female population in Ethiopia. And providing cancer screening guidelines to all HCPs regardless of their specialty could be key factor to lessen the burden of cervical cancer.

Key words: Psychometric, Cervical cancer screening, Intention, Female Health care professionals, Health Belief Model, Trans-theoretical model, Visual inspection with acetic acid, Ethiopia

CHAPTER I

STATEMENT OF THE PROBLEM

The global burden of cervical cancer is projected to continue to increase, rising to nearly 700,000 cases and 400,000 deaths by 2030, with analogous increases anticipated in future years. This represents a 21% increase in the number of cases and a 27% increase in the number of deaths over just the 12-year period. Most of these increases will be in women in low and middle income countries (LMICs), reflecting the severity of the global divide in cervical cancer morbidity and mortality (1, 2) . In total, 84% of the new cases and between 87% and 90% of the deaths occur in LMICs (3).

Cervical cancer is the third most common cancer among women in 45 countries around the world, and it contributes to 28% of deaths among women worldwide, many of which are in Africa (4, 5). Mortality caused by cervical cancer in Africa is disproportionately higher. In comparison, the mortality rates in the developed world where screening programs run successfully remain below 5 per 100,000 women. On average cervical cancer screening coverage in developing countries is 19% compared to 63% in developed countries; rates as low as 1% or less were seen in countries such as Bangladesh, Ethiopia, and Myanmar (6). Detecting cervical cancer in its earlier stages is life-saving. For instance, cervical cancer diagnosed at an early stage has a 5-year survival rate of 92% (7).The average, survival rates in Sub Saharan Africa are 21% compared to 70% in the USA and 66% in Europe(8).Despite this, in Ethiopia 27.19 million women are at risk of developing the disease with less than 1% women age 18-69 years are screened every 3 years (9, 10).

Screening is the principal preventive measure used to reduce the burden of cervical cancer (11). Regular screening is the single most important public health strategy to reduce cervical cancer incidence and subsequent mortality; doing regular screening (no more than once every three to five years) can prevent the disease in 45% in women 30 years of age and up to 75 % among women in their 50s and 60s.Early detection can greatly increase the chance of successful treatment resulting in an approximately 40% reduction in incidence and mortality associated with late stage or invasive cancer (12). Despite the importance of cervical screening, in Ethiopia the overall coverage of cervical cancer screening was found to be 0.8% and receive the recommended screening every 3 years according to the Information Centre on Human Papilloma Virus (HPV) and Cancer, 2017. Even if screening was widely available research to

date indicates that the availability of screening services alone is inadequate to increase screening participation (13-15).

Although the importance and effectiveness of cervical cancer prevention through screening has been demonstrated, the underlying reasons to explain why the majority of women are not utilizing available screening services have not been well described. Studies have shown that very few women in sub-Saharan Africa and LMICs are screened for cervical cancer. Low levels of awareness and poor knowledge coupled with a lack of available cervical cancer screening services are likely responsible for the very small number of women being screened (16).

Prior research has identified some of the influencing factors of perceptions like diverse demographic, socio psychological, and structural variables that may contribute to health behaviors, in seeking or avoiding cervical cancer screening (17) . Much of the work associated with cancer screening has been informed by the Health Belief Model (HBM) which is formulated on the belief that one's perception of a health threat can change behavior. The HBM focuses on preventing illness occurrence by encouraging health behaviors that avoid disease (18).

While the HBM has demonstrated the domains described above to be key factors predicting health actions, the trans-theoretical model (TTM) of behavior change will be used to address the stages of readiness to practice regular screening as the complex nature of decision-making process surrounding cervical cancer screening in adopting change of behavior (19).

The major factors associated with the lack of cervical cancer screening at the individual level include inadequate knowledge about the disease process, and access to cervical cancer screening. In addition, uncertainty about the purpose of cervical cancer screening, negative attitudes towards the procedure, lack of awareness of available screening methods and anxiety related to screening results are also major contributing factors (20-23).

The individual risk may also be based on personal characteristics or behaviors; being sexually active and have higher numbers of sexual partners (24). Additionally, it has been reported that women being poorly informed about cervical cancer and the associated risk factors, are unclear about the purpose of cervical cancer screening, and hold negative or inaccurate beliefs or attitudes about cervical cancer screening (25). Despite its proven importance, rates of attendance for screening programs vary widely, and are considerably low. The low prevalence of early cervical cancer screening and limited access to its treatments largely attributed to differences in diagnosis and subsequent mortality from the disease among high and low-income

countries. For instance; the screening uptake for cervical cancer in the three developing regions was only 6%, 12%, and 8.3% in South Africa, Bhutan, and Nigeria respectively (26) and in Ethiopia where, less than 1% of age eligible women receive effective screening for cervical cancer and 90% of women have never had a pelvic examination (27).

Purpose of the study

In an attempt to implement a cervical cancer prevention and control program in Ethiopia, the Federal Ministry of Health has developed cervical cancer prevention and control guidelines. The main goal of this guideline is to provide healthcare providers, partners and other stakeholders involved in the prevention and control of cervical cancer in Ethiopia with a standardized Cervical Cancer Prevention and Control Health Service Delivery Directive (28).

Ethiopia adopted the WHO recommendation and recommended that women begin cervical cancer screening at the age of 30 and above or three years past coitarche, and continuing screening at least once every three years. Effective, low resource screenings and treatment methods are recommended in the guideline including the "see and treat" screening strategy using VIA as the primary screening method and cryotherapy as a treatment option (4).

Researchers have reported that young women in LMICs are poorly informed about cervical cancer, unclear about the purpose of cervical cancer screening, and hold negative or inaccurate beliefs or attitudes about screening tests. Diverse demographic, psychosocial, and health beliefs may influence cervical screening perceptions and, thus, indirectly influence health-related behavior (17).

In order to improve screening participation among women, a better understanding of their knowledge, attitudes and health beliefs, which influence cervical cancer screening and participation behavior, is essential. The Health Belief Model (HBM) contains several primary concepts that predict why people will take action to prevent, screen for, or to control illness conditions (17).

There is considerable empirical support for the HBM to explain and predict certain health behaviors, particularly cancer screening (29). For behavior change to occur such as obtaining cervical cancer screening, people must feel threatened by their current behavioral patterns (perceived susceptibility and severity) and believe that change of a specific type of behavior will result in a valued outcome at an acceptable cost (perceived benefit). They also must feel competent (self-efficacious) to overcome perceived barriers to take action (17). And trans-theoretical model (TTM) of behavior change will be used to address the stages of readiness to

practice regular screening as the complex nature of decision-making process surrounding cervical cancer screening in adopting change of behavior (19).

One of the most important limitations in both descriptive and intervention research regarding HBM has been variability in the measurement of the central HBM constructs. Construct definitions need to be consistent with HBM theory as originally conceptualized, and measures need to be specific to the behavior being addressed and relevant to the population among whom they will be used (17).

International and domestic studies have used or modified Champion's HBM Scales to assess breast cancer screening behaviors, and the existing scales demonstrated adequate reliability with Cronbach coefficients ranging from 0.70 to 0.90. Modifying the Champions HBM scales used for breast cancer, a cervical cancer screening employing the same constructs also demonstrated adequate internal consistency (30).

Reliability varies by population and little is known about the scale's applicability to health care professional. A cervical screening behavior among health care professionals working at College of Health Sciences in Ethiopia using HBM has not received attention in previous research. The belief and action of screening among health care professionals guided by the HBM and the TTM also have not been previously investigated. Hence researching the belief, looking into preexisting factors towards their belief and intention of screening and determining predictive ability for cervical screening among female health care professionals at Addis Ababa University College of Health Sciences is of a great importance and will help bridge the gap for a better understanding for the low cervical screening participation and potentially lessen morbidity and mortality. In addition, for an effective screening program for CC, it is essential to understand the perceptions and beliefs of the population especially among healthcare professionals since they are at the forefront of providing health-related information.

RATIONALE OF THE STUDY

Programs emphasizing the benefits of screening have been shown to positively influence women’s cancer screening behavior and are needed to increase public awareness. The World Health Organization recommends the implementation of cost-effective and affordable interventions to address cervical cancer, stressing early detection as the cornerstone strategy for controlling cervical cancer and improving health outcomes and survival (31).

Ethiopia has put in place a strategic goal to reduce cancer incidence and mortality by 15% by 2020. Because of the burden and high mortality, cervical cancer is considered priority cancer for intervention. This ambitious plan aimed to reach 50% of the population with prevention

awareness information, 80% coverage of each year's target cohort of girls aged 9 to 13 with vaccination against HPV, reduce the exposure to HPV infections, 80% coverage of VIA to detect precancerous cervical lesions among non-symptomatic women aged 30–49 and increase awareness to 50% among the general population and health care providers of early signs and symptoms and opportunities for early detection of cervical cancer (32, 33)

While Ethiopia is working to make cervical cancer screening (CCS) available, improvement in availability alone will not be sufficient to result in increased screening uptake. For that, we need to understand and address the multifaceted health beliefs that are likely to influence women's behaviors and willingness to schedule and intention to obtain screening.

An understanding of the competing and motivating factors affecting the CCS behavior among women in the context of Ethiopia helps to enhance the screening and treatment efforts. In addition to their limited quantity; most previous studies conducted in Ethiopia narrowly emphasized cognitive dimensions and accessibility of service-related factors. However, none of them has comprehensively addressed the complex normative dimensions and circumstances that importantly influence the women's decision-making process and intention to use CCS. Hence, the study is the first of its kind in Ethiopia in applying the most widely applied and successfully studied behavioral theory to predict the intended use of cervical cancer screening services.

This study is innovative; by validating a HBM for CCS scale that will be applicable to women in Ethiopia will contributes to the growing literature in LMICs.

Efforts directed towards decreasing the morbidity and mortality associated with cervical cancer require both health providers and patients to practice secondary preventive measures such as VIA when available. Prognosis can be improved if screening is embraced and widely employed. For this, it is important that healthcare workers are educated and well aware so that they can influence the beliefs and actions of the general public. In efforts to promote screening health-care providers play a crucial role in educating women about the benefits of cervical cancer screening as encouragement and motivation from health providers appear to be important factors for ensuring that women receive screening tests.

Since nurses and medical practitioners make up the largest percentage of health care providers, their integration and participation in cervical cancer screening approaches would be very important and beneficial. Health professionals working in different areas are fundamental to a successful reduction in mortality from cervical cancer, since when living in the communities,

their work as health educators and promoters of screening is well noted that aligns with the needs of Ethiopian women and further highlights the importance of this study.

The efficacy of providing a cervical cancer prevention approach should be examined prior to implementation. One such strategy would involve health professionals as well as researchers on how the profession can contribute to improved cervical cancer screening rates among Ethiopian women, the population it serves.

Specific Aims:

Aim 1: Validate the psychometric properties of the modified HBM for cervical cancer and VIA among health care professionals

Aim 2: Determine the preexisting factors affecting the intention of cervical cancer screening among health care professionals

Aim 3: Determine predictability of HBM constructs with intention of cervical cancer screening among health care professionals

These aims contribute to the development of a validated tool for use for research and clinical purposes and determine the predictive ability of HBM constructs towards intention to screen. Also to identify factors affecting intention to screen for cervical cancer provides important perceptions that are essential for designing cervical cancer screening strategies that acquaint many women for programmed cervical screening utilization.

Background and Significance

Cervical cancer definition, cause and screening methods

Cervical cancer is cancer that starts in the cells of the cervix. Cervical cancer usually develops slowly over time. Before cancer appears in the cervix, the cells of the cervix go through changes known as dysplasia, in which abnormal cells begin to appear in the cervical tissue. Over time, if not destroyed or removed, the abnormal cells may become cancer cells and start to grow and spread more deeply into the cervix and surrounding areas. Adenocarcinoma and squamous cell carcinoma are the 2 most common histologic forms of cervical cancer (34, 35). More than 99% of cervical cancer cases are associated with genital infection with High-Risk type Human papillomavirus (HPV) infections (36). Human papilloma virus is well established to be the primary cause of cervical cancer. There are over 200 recognized serotypes of the HPV virus. The most common are HPV 16 and HPV 18, which are responsible for approximately 70% of cervical cancer cases. Other factors that increase young women's vulnerability to cervical cancer include oral contraceptive use, smoking, and susceptibility of the adolescent cervix to sexually transmitted infections. Due to the sexually transmitted nature of HPV, early onset of sexual intercourse and multiple sex partners are significant risk factors. It is reported that 80–

90% of women will have this sexually transmitted infection at some point in their life, although only 3–4% of them will develop cervical cancer (25). A woman dies every two minutes in developing countries from this disease (37). The most propitious feature of this cancer is that it is preventable and curable in the early stages and cervical cancer screening is vital for its prevention (38). Due to a lack of effective screening programs approximately 85% of women diagnosed with cervical cancer in these countries either die or develop serious morbidities as a consequence (39).

Available evidence supports the conclusion that cervical screening does offer protective benefits and is associated with a reduction in the incidence of invasive cervical cancer and cervical cancer mortality. Key to the success of all cancer screening is early screening of asymptomatic, healthy women when the cancer may be more amenable to treatment. Cancer screening is sub-optimal across different cancers and different delivery systems in Ethiopia (40). The screening methods for cervical cancer are mainly as following: traditional Pap smear, visual inspection with acetic acid & Lugol's iodine (VIA/VILI), liquid-based cytology (LBC) and HPV testing (41).

Cervical cancer screening by visual inspection with acetic acid (VIA) and immediate treatment with cryotherapy is recommended by the World Health Organization (WHO) for low- and middle-income countries as this method requires trained nurses, few resources, and the results are available immediately (42). As, VIA provides immediate results, thus promoting the linkage of screening with treatment. This "see and treat" method ensures adherence to treatment soon after diagnosis, and reduces the risk that women will be lost to follow-up in the referral system. VIA combined with cryotherapy (freezing of precancerous cervical lesions)in low-resource settings, can be conducted by competent clinicians and nurses (6, 43). Ethiopia has been working on cervical screening using VIA for more than a decade yet cervical screening among Ethiopian women is less than 1 % and has been noted that among women developing cancer, 50% to 60% have never been screened or adequately screened (41, 44). Despite the availability of guideline for cervical cancer prevention and control; screening was not fully implemented in all health care centers and its uptake among the community is still very low (7.3 to 23.5%). This could be attributed to lack of awareness about the importance and availability of cervical cancer screening services, perception about cancer, risk factors and prevention methods. On the other hand, screening uptakes as well as knowledge about cervical cancer risk factors and preventions are low among the health workers (44).

Prevalence

The last iteration of the Global Cancer Statistics 2020–GLOBOCAN censused approximately 600,000 global cases and 340,000 deaths in 2020, and both statistics are expected to increase without broad interventions (45). Cervical cancer is the fourth most common cancer in women, with an estimated 530,000 new cases every year, representing 7.9% of all female cancers (36). It is a serious health condition that affects women both at primary and at later stages of their lives and is responsible for approximately 270,000 deaths annually worldwide (5).

Over the past 30 years, the increasing proportion of young women affected by cervical cancer has ranged from 10% to 40% (46). In developing countries, the number of new cases of cervical cancer was 452,000 and ranked second among malignancies in female patients (45). Conversely, the number of new cases of cervical cancer was 77,000 in developed countries and ranked tenth among female malignancies (41). Human papillomaviruses (HPVs), a group of double-stranded DNA viruses, are the main cause of cervical cancer. HPV is the most common sexually transmitted infection (47). The progression from HPV infection, to persistent infection, to pre-cancerous cervical changes, to invasive cervical cancer typically takes 10 to 15years or more, but cases of more rapid progression less than 5years have been reported (48).

SOCIO-DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS

Diverse demographic, socio-psychological, and structural variables may influence perceptions and thus, indirectly influence health-related behaviors. For example, socio-demographic factors, particularly years of education, have a direct effect on behavior by influencing the perception of susceptibility, severity, benefits, and barriers (49).

Studies have documented that several demographic factors contribute to the low uptake of cervical screening including education, income, marital status and age (50). Study findings from Australia, India, and Ethiopia have indicated that the age of an individual is major factor in cervical screening uptake; women younger and older women than those in their 30's was less likely to have had a Pap test (4, 51, 52). These findings are similar to a study in Botswana among female university students which showed that an increase in age to be the only factor found to be associated (P = 0.001) with an increased likelihood of obtaining cervical cancer screening (53). There is also considerable evidence from different countries to suggest that women of lower socio-economic status (SES) are less likely to participate in cancer screening than those who are more economically advantaged (54). In addition, adherence to cervical cancer screening recommendations is significantly related to better financial status (55).

The study done in China states, Zimbabwe, Nigerian women sought to evaluate reasons behind failure to participate in CCS that respondents in older age groups were less likely to have had a cervical smear test Odds Ratios (OR) for women aged 60–69, 70–79 and 80 or above, age, income, smoking status, and education and knowledge of CC made a significant impact on adherence to CCS (56).

From a study in Mekelle: the odds of getting screened for cervical cancer in female nurses who work at the outpatient department were 3 times more as compared to female nurses who work in other wards (57). Being a physician (adjusted odds ratio [AOR] =0.12, 95% CI: 0.02, 0.79) and working in a cervical cancer screening center (AOR =0.14, 95% CI: 0.03, 0.68) had a lower odds of cervical cancer screening practices (58).

Women with an awareness of HPV were more likely to be older, studying a health-related major, have a higher class standing, have a personal history of gynecologic visits, and have had a Pap test (59).

LIFE STYLE AND CERVICAL CANCER SCREENING

Major behavioral risk factors associated with the development of cervical cancer endorsed by the American Cancer Society (24) include smoking, age at first intercourse, multiple sexual partners and HPV infection (60).

Several studies have documented that health behaviors are also associated with adherence to cervical cancer screening recommendations. Hazardous drinking (score of 8 and above) using Alcohol Use Disorders Identification Test (AUDIT) a 10-item measure developed by a World Health Organization collaborative and increased number of cigarettes smoked per day, are associated with poor Pap smear screening adherence (7). Conversely, women who drank alcohol regularly but not excessively were more likely to have had a Pap test (51). In a study conducted with female nursing undergraduate students in a public university in the USA, variables associated with obtaining a Pap smear included: being in a relationship for one year or longer, being a non-smoker and initiating sexual intercourse at an early age. In contrast, a study conducted by Lindley et al. (2009) found that women who obtained Pap smears were more likely to have been smokers (18). A study from Australia on associations between sexual behavior and cervical cancer screening revealed those without a regular partner were less likely to have had a recent Pap test. Cancer screening among female university students from 25 low, and middle-income countries showed risky sexual behavior and tobacco use was associated with screening (61). Cervical cancer screening was also poor among sexually active students in Saudi Arabia in particular and female family members in general (62). Due to the lack of

consistency among study findings, larger studies on factors that contribute to cervical cancer screening are warranted.

Women attending cervical cancer screening and diagnosis center at Yirgalem General Hospital, Southern Ethiopia; from the screened and diagnosed clients those with multiple sexual partners had 40 times higher odds of cervical than those with no multiple sexual partners. This study revealed that being Human immune deficiency virus-positive (AOR=9.033: 95%: CI 4.537, 17.985), sexually transmitted infection history (AOR=8.364:95% CI: 5.639, 12.405) and early age at initiation of sexual intercourse (AOR=8.968:95%: CI 5.588, 14.393) have statistically significant association with cervical cancer screening (63).

HISTORY OF SEXUALLY TRANSMITTED DISEASE

Studies have demonstrated that up to 80% of sexually active adults will acquire at least one HPV type infection during their lifetime, and the infection affects 26.8% of women of reproductive age (64). HPV is a highly prevalent STD and HPV infection has reached epidemic proportions in college females due in large part to high-risk sexual activity. This trend indicates a rising wave of cervical cancer in the future, and the importance of regular Pap tests (65). Female adolescents who have unprotected sexual intercourse are at higher risk for contracting HPV and other STDs than their peers who either abstain from or have protected sexual intercourse (51).

The finding of a study in south Ethiopia reveals being Human immune deficiency virus-positive (AOR=9.033: 95%: CI 4.537, 17.985), sexually transmitted infection history (AOR=8.364:95% CI: 5.639, 12.405), multiple sexual partners are significantly associated with cervical cancer as compared to those women who have no exposure of multiple sexual partners (AOR=40; 95% CI: 22.44,70.204) and having history of STI exposure and being HIV positive became significant with the outcome variable of the study as compared to those women who have no history of STI exposure and HIV negative (AOR=8.3 :95%CI: 5.639,12.405) and (AOR=9:95% CI: 9:4.537,17.985) respectively (63).

Findings of studies conducted in different parts of Ethiopia showed having history of multiple sexual partners of the husband found to have 2.973 times association for cervical cancer screening with (AOR=2.973; 95%CI=1.414-6.247) compared to having one sexual partner of the husband. Also having one sexual partner of the husband found to have association for cervical cancer screening behavior than not having multiple sexual partners of the husband (66).

The same result reported from Mekelle showed that women who have history of multiple sexual partners were 1.635 times association for cervical cancer screening behaviour with(AOR =1.635,95%CI =1.094–2.443) (4). Also study conducted in Yirgalem showed that having multiple sexual partner of the husband had significant association with cervical cancer screening behavior with(AOR=40; 95% CI: 22.44,70.204) (67). In addition, similar findings of study conducted in Finote Selam Town North west Ethiopia showed that having history of STDs were nearly 2.75 times had association with cervical cancer screening behavior with(AOR= 2.75, 95%CI:1.24,6.04) same result was also reported from Mekele, where women with history of sexually transmitted disease had 4.129 times significant association with the cervical screening behavior with (AOR = 4.129, 95% CI = 2.281–7.476) (63).

KNOWLEDGE OF CERVICAL CANCER AND SCREENING

Inadequate knowledge and lack of awareness can become a barrier to cervical cancer prevention (39, 68-70). It is well established that knowledge does not always translate into behavior but improved knowledge has been found to increase the rate of cervical cancer screening in most research settings (69). In one study of young women, only a minority of women have any knowledge or awareness of HPV in relation to cervical cancer (60). Many participants in previous screening studies have little knowledge of cervical cancer and early screening. Lack of knowledge regarding cervical cancer screening, and insufficient information available about screening centers prevents women from receiving care at healthcare clinics (71). Previous studies have found that women with a high level of cervical cancer prevention knowledge and awareness of screening facility location are more likely to seek screening (31).

A study conducted among college students, in the USA, Kingdom of Saudi Arabia, Ghana, South Africa, Nigeria, and Ethiopia found low awareness levels for the issues related to screening and revealed there were specific gaps in knowledge about cervical cancer risk factors(25, 51, 72-74). Further, a study that examined knowledge and attitude of female medical students, in Ukraine demonstrated that only 58% had heard about cervical cancer screening; 17% of respondents knew about the HPV test while only 3% knew about VIA testing for cervical cancer (73, 75).A study in China of a sample of medical students found females were more likely to accept HPV vaccines (OR, 1.86; 95% CI: 1.47-2.35) or cervical cancer screening (OR, 3.69; 95% CI: 2.88-4.74) (76).

Finding from the US study indicated females were significantly more knowledgeable about the relationship between HPV and cervical cancer and that changes in a Pap smear may indicate an

HPV infection ($p < .05$). Younger participants (18-22 years) were more aware of the existence of the HPV vaccination when compared to older participants(23 - 24 years) ($p < .05$) (77).

Although a positive association between women's knowledge about cervical cancer and the likelihood of her having a Pap smear has been found, poor uptake of screening services among the better-informed healthcare workers, and patients, was a recurrent finding in the studies reviewed and reasons for this should be further investigated. The recommendation of healthcare providers can also influence screening behavior, and providers who lack basic knowledge may be a problem in this context (78).Another finding from a study in Turkey among nurses came up with there was a statistically significant relationship between having received a Pap test and having a history of cancer in their family ($p< 0.05$)(79).

In sum, previous research demonstrated low levels of knowledge and awareness about cervical cancer screening which decreases the likelihood of participating in the recommended guidelines for screening. This low level of awareness could be attributed to different factors like the socio-demographic background, level of knowledge, and attitude. The results were not expected for literate women in a college environment, however further investigation and exploration for possible solution is needed as nurses or other health care workers play an important role in successful screening against cervical cancer.

CERVICAL CANCER SCREENING BEHAVIORS AMONG HEALTH CARE PROFESSIONALS

As evidenced by the literature, a high level of awareness and knowledge of cervical cancer demonstrated by health professionals did not translate to the proper utilization of the screening services (57). For example, a study involving Ukraine medical students revealed even though 82% were aware that cervical cancer is a major health concern, only 32% had ever obtained a pap smear (80). Another study in South India among nursing staff revealed similar findings with only 5 (4%) had undergone a previous Pap smear examination (81). Health science students who showed negative or uncertain attitudes towards premarital sex were less likely to accept either HPV vaccines (OR, 0.67; 95% CI: 0.47-0.96), or cervical cancer screening (OR, 0.68; 0.47-0.10) (82).Although surprising, physicians were 88% less likely screened for cervical cancer than other health care workers were (AOR =0.12, 95% CI: 0.02, 0.79). In addition, those who were working in cervical cancer screening centers were 86% less likely to be screened for cervical cancer than their counterparts (AOR =0.14, 95% CI: 0.03, 0.68) (58).

Among the 225 respondents, only 24 (10.7%) nurses reported that they have ever been tested for cervical cancer in the past five years (2009–2014). The most common reasons for not being

screened for cervical cancer were carelessness (17.9%),fear of positive results (16.4%),and fear of pain(10.9%),among a list of different reasons (57).

The most common reasons cited for having cervical cancer screening from studies conducted in China, Nigeria, Ethiopia were importance or positive attitudes and awareness towards screening practice (4, 82-84).

A study among nurses in Addis Ababa Nurses who ever taken care of a cervical cancer diagnosed patient and who ever visited a health institution were 2 and 4 times more likely to practice preventive measures than those who didn't practice (AOR=2.412, 95%CI=1.153-5.046; AOR=4.203, 95%C=1.390-12.708), respectively). Professional experience was also found to be significantly associated with preventive practice (85).

HEALTH BELIEF MODEL AND ITS RELATIONSHIP TO CERVICAL CANCER SCREENING

According to the HBM theory, for behavioral change to succeed people must have an incentive to take action, feel threatened by their current behavioral patterns, and believe that change of a specific kind will be beneficial by resulting in a valued outcome at acceptable cost, but they must also feel themselves competent (self-efficacious) to implement that change.

PERCEIVED SUSCEPTIBILITY

The likelihood of taking preventive action increases when the individual has a sense of perceived susceptibility or vulnerability to cervical cancer (86). In Uganda among medical workers including nurses, doctors and final year medical students agreed that cervical cancer was a public health problem; but 81% eligible female respondents had never been screened, mostly because they did not feel vulnerable to the disease. Sixty eight percent thought that it was easy to diagnose and 65% of the participating females did not think they were susceptible to cervical cancer themselves, while 60% of males thought that their partners were susceptible. It is unlikely that these medical workers would feel motivated to screen others or advise them (87).

Individuals who perceive themselves to be at risk of a cervical cancer diagnosis were 1.8 times more likely obtain Pap smear than those who perceived themselves not to be at risk (AOR.834; 95CI; 1.094-3.067), (P = 0.02). A study conducted in Mekelle, Ethiopia found that women who perceived their potential susceptibility to develop cervical cancer was higher 2.225 times more likely to be screened compared to those with less perceived susceptibility (AOR = 2.225, 95%CI = 1.308–3.783). Approximately half (50.72%) of the participants lacked a sense of personal susceptibility to cervical cancer and showed no interest in obtaining screening (74).

PERCEIVED SEVERITY

A systematic review among Vietnamese American women using the HBM to predict Pap smear testing found that among the six studies that included measures of perceived severity of cervical cancer, only two suggested higher levels of perceived severity of cervical cancer were associated with an increased odd of having had a Pap screening (29).

A study in Ghana indicated more than 68% perceived that young women were susceptible; a lower percentage (52.5%) believed that they themselves were at risk for cervical cancer. About 3 quarters (73%) of respondents believed that cervical cancer was a serious disease that would make a woman's life difficult (72). Within the "health belief" box, perceived susceptibility and severity are combined to identify threat (17).

PERCEIVED BENEFITS

Even if a person perceives personal susceptibility to a serious health condition, (perceived threat), whether this perception leads to behavior change will be influenced by the person's belief regarding the perceived benefits of the various available actions for reducing the disease threat (49).

A study conducted on female undergraduate nursing students in the US revealed non-routine group of participants perceived lower benefits and higher barriers to obtaining Pap smear testing than the routine group of participants (who obtain pap tests every 2 to 3 years). The non-routine group was less likely to believe that the Pap smear is a beneficial screening test that is able to identify abnormal cervical cells early or that it is the best way to find abnormal cervical cells. The non-routine group was also less likely to trust the Pap smear test's ability to detect precancerous or cancerous cervical cells (18).

In terms of perceived benefits of a Pap test, approximately 50% of the Vietnamese American women participants believed that Pap tests were the best method to detect cervical cancer and if detected early, could be easily treated and the Pap smear test key to staying healthy. Women who perceived these benefits were two to four times more likely to of having received Pap test compared with those who did not(29). In support of these findings, students in Ghana understood that cervical cancer screening had benefits; they believed that the test could find cervical changes before they became cancerous and could be easily cured (16).

PERCEIVED BARRIER

According to Al -Naggar and Isa (2010), barriers influencing Pap screening are embarrassment, fear of pain, cost, and access to health care, examined by a male, lack of awareness and fear of infection. A study found that medical students were embarrassed and anxious about having a

vaginal or pelvic examination done by male doctors. According to Watkins and Cousins, fear is detrimental to people being able to perceive themselves at risk, and for this reason. Knowledge of cervical cancer, screening practices and vaccines among female medical students in Dominican Republic highlights the major barriers to cervical cancer screening in the perception they are healthy, the embarrassment and cost of the procedure (29, 39, 87-89).

Study from Iran revealed the most important perceived barriers to cancer screening included: embarrassment about undergoing a Pap smear test, lack of time for undergoing a Pap smear test, fear of Pap test pain, fear of positive Pap test results, doubts about Pap test effectiveness, and fear about the procedure of a Pap smear test(90). In contrast, the belief that cervical cancer is a terminal illness and death is inevitable when cancer is detected has been identified as a barrier to participation in cancer screening, detection and treatment (91).

Lack of knowledge of cervical cancer among health workers was seen as a primary barrier for access to cervical cancer screening in Cameroon. Similar findings showed that lack of advice and encouragement from health workers affected the screening of women in Zimbabwe (39, 92).

Five qualitative studies (focus groups and interviews) were conducted among low-income women in Venezuela, Ecuador, Mexico, El Salvador, and Peru regarding barriers and benefits of cervical cancer screening, many of the participants who were married also indicated that their husband's would not be comfortable knowing that their wife was having a cervical cancer screening performed by a male doctor. With the exception of giving birth, participants indicated that is a taboo for a man, even a doctor, to see another man's wife naked. In addition, preventive healthcare is uncommon and underappreciated (93). The study from Uganda indicated 25% of the female respondents said that they would only accept a vaginal examination by a female health worker (89).

Perceived barriers have a significant impact on cervical cancer screening participation. For example, factors influencing participation in cervical cancer screening clinic in Jamaica, women with perceived barriers to cervical cancer screening were 76% less likely to be screened than those who had no perceived barriers. In support of these findings, a likely to be screened than those who have perceived barriers (AOR = 2.256, 95%CI = 1.447–3.517) (4).

Condition like free health check-up, that could minimize certain barriers will aid an increase to the number of women participants for screening (74).

SELF-EFFICACY

Regarding measures of self-efficacy, women who were confident in their abilities to schedule a Pap test, to undergo the Pap test, or to manage any emotional distress caused by the test reported substantially higher screening rates (72%–73%) than those who lacked strong confidence (14%–16%) ($p<0.001$) (29).

Additionally behavioral intention among health science undergraduate students in India revealed that less than 4% of the students stated an intention to receive the HPV vaccine in the future due to "not being at risk."(94).

From Mizan Tepi University only 31(14.83%) have been screened for cervical cancer. The rest had not been screened for cervical cancer because of different reasons (74).

TRANS- THEORETICAL MODEL AND ITS RELATIONSHIP TO CERVICAL CANCER SCREENING

In developed countries, where there is proper access to effective cervical cancer screening programs, the regular use of the Pap test is higher than in developing countries, resulting in a lower rate of death from cervical cancer in these countries.

TTM has become one of the most commonly applied theoretical and clinical frameworks and is effective across a broad spectrum of problems and to preventative measures such as medical screens like mammography and cancer screening (95). Specifically, the stages of change construct, provides a method to deliver messages based on the participant's readiness to change their cancer screening behavior (96). Women with a lapse in a behavior or adopting a new behavior, such as cervical cancer screening, progress through a series of stages of readiness to change including: (a) precontemplation, no intention to complete screening; (b) contemplation, serious thoughts about completing screening in the next six months; (c) preparation, intention to complete screening in the next month; (d) action, completed screening; (e) maintenance, work to prevent relapse in not undergoing screening; and (f) termination, behavior change is complete and not at risk for relapse (96).

Research on the TTM as it relates to cervical cancer screening has supported these hypothesized associations between stages of change and perceived benefits and barriers (96). Several potential factors may explain the low uptake of regular Pap tests among women. In a study among Iranian women, which examined the role of theory-based cognitive factors in the uptake of the regular Pap test; according to their results, the perceived benefits, the perceived barriers, and perceived self-efficacy emerged as predictors of cervical cancer screening's stages of

change. According to the stages of Pap test adaptation, women in later stages (for example: maintenance) demonstrated higher levels of perceived benefits, higher levels of perceived self-efficacy, and lower levels of perceived barriers than women in the earlier stages (for example: pre-contemplation) (90). Women in Action and Maintenance were also more likely to have had their last Pap test by a female GP compared to women in relapse categories. Women in Pre-contemplation were more likely than women who had Pap tests to agree that they would travel a long way to see a practitioner who spoke their own language (97).

Being in the action stage was significantly related to a reduced number of reported barriers ($p < .001$) with a rate ratio of 0.61 (95% confidence interval [CI]: 0.46 – 0.82) for those in the action stage. This indicated roughly a 39% decrease in the number of barriers for those participants in the action stage compared to those in the other three stages (pre-contemplation, contemplation, and preparation) (96). Univariate logistic regression analyses were used to explore demographic and health factors associated with being in the action stage. At the completion of the intervention, women ≤ 30 years (odds ratio [OR] = 1.92, 95% CI = 0.63, 5.85) or > 30 years and ≤ 50 years (OR = 4.20, 95% CI = 1.51, 11.68) were more likely to be in the action group than those over age 50 years. All other measured variables were not significantly related to being in the action stage (96).

The study in the Ohio Appalachian women examined the association between endorsement of barriers, stage of change, and screening attendance using univariate and multiple logistic regression analyses. In unadjusted analyses, women with the following barriers were less likely to be in the action stage: lack of provider recommendation ($p = 0.004$), being embarrassed by having a Pap test ($p = 0.05$), cost ($p = 0.03$), and being nervous and afraid of completing a Pap test ($p = 0.05$) (96). Multiple linear regressions and multiple comparisons with Bonferroni correction revealed that participants in action/maintenance stages showed significantly higher self-efficacy scores ($M = 75.50$, $SD = 21.10$) than those in contemplation/preparation stages ($M = 65.20$, $SD = 24.38$, $p = 0.015$) and those in pre-contemplative /relapse stages ($M = 50.35$, $SD = 21.40$, $p = 0.002$). Women in the pre-contemplative/relapse stages reported significantly higher perceived barriers scores ($M=2.71$, $SD =0.52$) than those in contemplation/preparation ($M=2.14$, $SD=0.44$, $p=0.009$) and action/maintenance stages ($M=2.02$, $SD = 0.49$, $p = 0.0006$) (96).

A study in south west Ethiopia among women attending gynecology out-patient department and maternal and child health revealed the majority of the participants 225(70.1%) have no intention for cervical cancer screening while 96 (29.9%) have the intention to get screened (66).

Summary of the literature review

The efficacy of providing a cervical cancer prevention approach should be examined prior to implementation. One such strategy would involve health professionals as well as researchers on how the profession can contribute to improved cervical cancer screening rates among Ethiopian women, the population it serves.

What is known?

Ethiopia is working to make CCS available. Understanding the competing and motivating factors affecting the CCS behavior among women in the context of Ethiopia helps to enhance the screening and treatment efforts. In addition to their limited quantity; most previous studies conducted in Ethiopia narrowly emphasized cognitive dimensions and accessibility of service-related factors.

Efforts directed towards decreasing the morbidity and mortality associated with cervical cancer require both health providers and patients to practice secondary preventive measures such as VIA when available. Prognosis can be improved if screening is embraced and widely employed. For this, it is important that healthcare workers are educated and well aware so that they can influence the beliefs and actions of the general public. In efforts to promote screening health-care providers play a crucial role in educating women about the benefits of cervical cancer screening as encouragement and motivation from health providers appear to be important factors for ensuring that women receive screening tests.

Since nurses and medical practitioners make up the largest percentage of health care providers, their integration and participation in cervical cancer screening approaches would be very important and beneficial. Health professionals working in different areas are fundamental to a successful reduction in mortality from cervical cancer, since when living in the communities, their work as health educators and promoters of screening is well noted that aligns with the needs of Ethiopian women and further highlights the importance of this study.

What is unknown?

The complex normative dimensions and circumstances that importantly influence the women's decision-making process and intention to use CCS has not been comprehensively addressed in Ethiopia. The psychometric properties of a widely applied and successfully studied behavioral theory has not been previously examined among health care professionals in Ethiopia and the

stages of change in relation with intention to screen was not addressed. Furthermore; predictive ability of the model for intention to get cervical cancer screening is unknown.

In summary, this section has provided an overview of a review of literature on cervical cancer mortality, socio-demographic and economic characteristics in relation to cervical cancer, health behavior and cervical cancer screening, history of STD, knowledge of cervical cancer and screening, cervical cancer screening behavior among different population. Also; health belief model and its relationship to cervical cancer screening and the stages of change in behavior using the TNM and forecasting its relation with cervical cancer screening intent was underlined. The next section outlines the framework for the study followed by method to be used to carry the study.

THEORETICAL FRAMEWORK

The HBM framework presented as one of the theoretical approaches to promote and maintain a life style change that encourages health promotion, health maintenance, and assist in decreasing complications due to chronic illness. The Health Belief Model (HBM) has been applied to a broad range of health behaviors and subject populations. Three broad areas have been identified using the HBM(Conner & Norman, 1996): (1) Preventive health behaviors, which include health-promoting (e.g. diet, exercise, vaccination) and health-risk (e.g. smoking, sexual) behaviors, (2) Sick or healthy role behaviors, refers to compliance with recommended medical regimens, (e.g. following professional recommendations for treatment and medication, adhering to follow-up after screening) and, (3) Clinic use, includes physician or nurse visits for a variety of reasons(98).

There is limited research however, on the use of the HBM for examining cervical cancer screening among health care professionals working at the College of Health Sciences in Ethiopia. The findings from this study may inform future studies testing methods to empower female health care professionals to overcome barriers associated with cervical cancer screening increasing screening rates and ultimately to reduce the number of new cases. The HBM is considered appropriate for this study because the model is not only used in addressing individual behavior, but it is also effective in addressing health conditions that evoke care and concern such as cervical cancer screening (17).

HEALTH BELIEF MODEL AND CERVICAL CANCER SCREENING

For the proposed study, the investigators will use the HBM to examine knowledge, attitudes, beliefs and treatment-seeking behavior surrounding cervical cancer screening and assess the factors that influence the health seeking behavior. In the model we will look at the following variables: Pre-existing factors (age, marital status, occupation, monthly income and work experience), Clinical (oral contraceptive use, STD, number of pregnancy), Life style (smoking, alcohol use, substance use, age at first intercourse, multiple sexual partners) and the constructs of the HBM; perceived health threats (readiness to seek care or not, history of cervical cancer, family history),perceived barriers (education levels, knowledge and awareness, fatalistic expressions, embarrassment issues, fear of pain, cost and time), perceived benefits (less likely to have cervical cancer), and self-efficacy (confidence in ability to decide to obtain cervical cancer screening).

TRANS-THEORETICAL MODEL AND CERVICAL CANCER SCREENING

The stage of change theory is one of the most important theoretical frameworks that have been shown to be useful in assessing an individual's readiness to act on health behavior(90). Women can be described along a series of stages of readiness to practice regular Pap test screening: (a) pre-contemplation: never had a Pap test and no intention to have one within the next 6 months; (b) contemplation: never had a Pap test but intends to have one within the next 6 months; (c) preparation: never had a Pap test but intends to have one within the month; (d) action: had one Pap test in the past year and intends to continue getting regular Pap tests; (e) maintenance: had regular Pap tests and intends to continue to do so; (f) relapse risk: on schedule, but no intention to get one in the future; and (g) relapse: had Pap tests in the past, none in the last 3 years, and does not intend to get one (19). For this study PAP test is changed to VIA as this is the common screening technique used in Ethiopia.

CONCEPTUAL FRAMEWORK

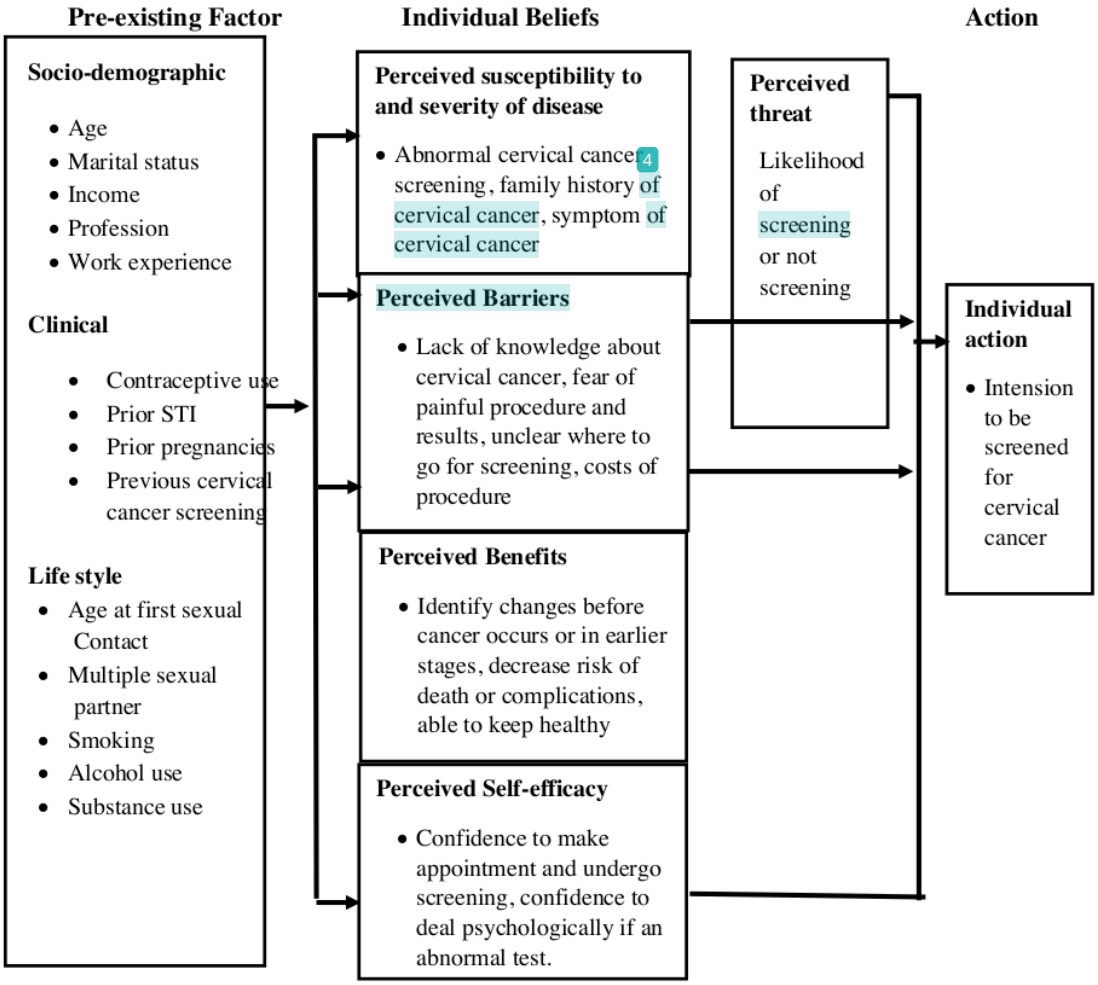

Figure 1 Conceptual model adapted based on Health Belief Model, Rosenstock 1974

RESEARCH METHODS

Study design

This dissertation was based on a primary analysis to validate the psychometric properties of the modified HBM for cervical cancer and VIA, to determine the intention of screening with visual inspection with acetic acid (VIA) and its determinants among female healthcare professionals

(HCPs) guided by the trans-theoretical model (TTM) of stages of behavior change and to identify predictability of HBM constructs with intention of cervical cancer screening using cross-sectional design.

Study participants and setting

The study took place at Addis Ababa University College of Health Sciences from April 2020 to mid of June 2020. Addis Ababa University (AAU), which was established in 1950 as the University College of Addis Ababa (UCAA), is the oldest and the largest higher learning and research institution in Ethiopia. Since its inception, the University has been the leading center in teaching-learning, research and community services. The College of Health Sciences (CHS), Addis Ababa University (AAU), is a professional health sciences college, established in 2009/10 by the reorganization of previously separate institutions of health under one umbrella. AAU now has 8,709 staff (3,110 academics, 4,346 admin support staff and 1253 health Professionals) (AAU portal). As per the office of human resource of the College of Health Sciences there are 3017 permanently employed staffs where 913 were academics (683 male and 230 female), 1204 health professionals (457 male and 747 female) and 900 administrative staffs (236 male and 664 females). This dissertation work enrolled multidisciplinary group of female health care professionals like nurses, midwives, physician, pharmacist, lab technicians and others working at Addis Ababa University, College of Health Sciences in 2020. The setting is selected since it the only teaching and health service provision area inclusive all types health care professionals and better fitting to the aim of the study. Participants were, 30 years old and above. The rationale for including women 30 years of age or older is because cervical cancer has a long precancerous period, usually taking more than 10 years to progress from precancerous lesions to invasive cancer. As a result, it is rare for cervical cancer to develop in a woman less than 30 years of age (WHO 2006). In addition, the Federal Ministry of Health of Ethiopia supports implementing VIA testing starting age 30. The sample size was calculated using psychometric testing, the total sample size was determined with reference to the number of participants per item. A wide range of recommendations about sample size in factor analysis has been made from 3:1 to 5:1 subjects per item (99). For this study ratio of 5:1 was used for the exploratory factor analysis. The Champion's HBM scale to be tested for validity and reliability contains 42 items, with thus the sample size was 210 (42items times [5 subjects per item]). For the other two aims of the study including sample size was determined using Epi INFO STAT Calc. sample calculation for population survey; by considering the expected frequency of 25% obtained prevalence of cervical cancer screening practice from a study on cervical cancer screening knowledge and barriers among women in Addis Ababa, Ethiopia

(100). Assuming population size 977, 3% marginal error (d), 95% confidence interval, hence n= 440. The total sample size by adding 10%non-response rate was n = 484.

Data Collection

Different data collection strategies were used in this study. Study-developed data extraction forms and standardized instruments were used to collect demographic, clinical, lifestyle, knowledge, HBM constructs and TTM. The summary of variables and measurement instruments are provided in Table 1**.**

Table 1 Summary of variables and measurement instrument

Variable	Instrument	Instrument Description	Psychometrics
Socio-demographic	Self-developed	age, marital status, income, work experience, profession, and level of education.	
Clinical		contraceptive use, history of STD, past history of screening tests for cervical cancer, history of taking care of patients / family member with cervical cancer (101).	
Life style		age at first sexual contact, multiple partners, alcohol consumed, condom use, smoking status: (101).	
Knowledge of cervical cancer and screening	Previously tested tool by Thapa and Oche (2018)	28 item question to elicit risk factors (5 items), sign and symptoms (5 items), preventive measures (8 items), and its screening (10 items) (102, 103) Bloom's cut of Good knowledge if it comprises a score of 23-28 (80-100 %), moderate with scores of 16-22 (60-79%) and poor if the score was <16 (<60 %) (104).	Cronbach's α value 0.90
***HBM constructs*:**	Champion's HBM to Breast cancer and 'Health Belief Model Scale for Cervical Cancer and the Pap Smear Test'	42 items in six subscales: Benefit (1^{st} – 8^{th}), Barrier (9^{th}- 26^{th}), seriousness (27^{th} - 33^{th}), susceptibility (34^{th}- 36^{th}), health motivation (37^{th} – 39^{th}) and (40^{th} – 42^{nd}) for self-efficacy	Cronbach alpha reliability coefficient of the subscales ranges 0·62 to 0·86
***TNM*:**	Stages	describes health care professionals along a series of stages of readiness to practice regular VIA screening	
	pre-contemplation	Never had a VIA and no intention to have one within the next six months	
	Contemplation	Never had a VIA but intends to have one within the next six month	
	Preparation	Never had a VIA but intends to have one within the month	
	Action	Had one VIA in the past year and intends to continue getting regular VIA	
	Maintenance	Had regular VIA and intends to continue to do so	
	Relapse risk	On schedule, but no intention to get one in the future	
	Relapse	Had VIA in the past, none in the last three years, and does not intend to get one	
	Intention to obtain cervical cancer screening	if respondents say 'Yes' as a response for (contemplation, preparation, action, maintenance) of the TNM stages (19).	
	No intention to obtain cervical cancer screening:	if respondents say 'Yes' as a response to (pre-contemplation, relapse risk, relapse) of the TNM stages (19).	

Data Analysis

Data were entered and cleaned using Epi info version 7, and exported to a computerized Statistical Package for Social Sciences (SPSS) version 25 for analysis.

Aim 1: Psychometric properties of a modified health belief model for cervical cancer and visual inspection with acetic acid among healthcare professionals in Ethiopia

Construct validity of the scale was examined using EFA and principal axis factoring (PAF) extraction with oblimin rotation. The loading criterion was set as ≤ 0.3 and Bartlett's tests was used to analyze sampling adequacy. Reliability included internal consistency and was estimated using Cronbach alpha coefficient values for the different domains of the instrument. Cronbach's alpha between 0.70–0.90 is considered to reflect adequate internal consistency (105). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was used to quantify sufficiency of item correlation for performing factor analysis. The KMO index ranges from zero to one and, the minimum acceptable value is 0.60. Bartlett test of sphericity test was applied to assess the presence of correlations among variables significant value ($p < 0.05$) indicates the appropriateness of EFA (106). Generally, the results indicated strong factorability and supported conducting an EFA. Factor extraction analysis was conducted using PAF to determine the number of factors to retain, as follows: (a) using the Guttmann- Kaiser greater-than-one rule which recommends that only those factors with eigenvalues > 1.0 be retained; (b) using the Cattell scree test, which involves constructing 16 plots of extracted factors against their eigenvalues in descending order of magnitude; (c) by applying the Monte Carlo Parallel analysis rule, which compares factor eigenvalues to a set of eigenvalues generated from random data, and recommends retaining those eigenvalues that exceed the corresponding values from the random data; and, (d) by calculating the amount of total variance explained by the communality of each variable to determine the number of factors to be preserved (107). PAF was conducted together with oblique rotation (direct oblimin) which is often seen as producing more accurate results for research involving human behaviors. Regardless of which rotation method is used, the main objectives are to provide easier interpretation of results, and produce a solution that is more parsimonious. Items were deleted from the EFA if factor load was < 0.5, loaded on more than one factor, or not loaded on any factor (108). In confirmatory factor analysis (CFA), model fitness was assessed by (a) over model fitness, using the Chi test $\chi 2$ (p) ($p > 0.05$) and normed (Chi-square and df ratio) $\chi 2$ (CMIN/df) ≤ 3; (b) incremental fitness with comparative fit index (CFI) and normed fit index (NFI) ≥ 0.95 and; (c) absolute fitness with, goodness-of-fit index (GFI), adjusted GFI (AGFI) ≥ 0.80 ,root mean square residual (RMR) ≤ 0.08, and root mean square error of approximation (RMSEA) ≤ 0.06 (109). The method used to potentially further refine /remove items from the instrument was with load <0.3

or, higher covariance, and estimates of the residual variance. The criteria for convergent validity were as follows composite reliability ≥ ± 1.97 ($p < 0.05$); and average variance extracted (AVE) ≥ 0.50 (110).

Aim 2: Intention to screen for cervical cancer and factors associated among female healthcare professionals using the trans-theoretical model: Addis Ababa, Ethiopia

Descriptive statistics such as means and standard deviations and frequencies were calculated. Contributions of the predictors of the outcome variable intent to screen for cervical cancer were examined by performing a logistic regression analysis. Multicollinearity was checked using tolerance and variance inflation factor (VIF). Variables with p-value < 0.2 during the bivariate analysis considering each predictor one at a time were included in the final model. Multiple logistic regression analysis was computed to consider the conditional effects of factors. Crude odds ratios (COR) were computed for each predictor one at a time for the outcome. Adjusted odds ratio (AOR) and 95% confidence intervals (CI) were constructed to measure the strength of association between the intent to screen for cervical cancer and the selected predictors combined together in the final logistic regression model. For all statistical tests, p-value ≤ 0.05 was considered statistically significant.

Aim 3 Health Belief Model ability to predict intention to screen for cervical cancer using visual inspection with acetic acid among female healthcare professionals

Perceived susceptibility to cervical cancer, perceived benefits of cervical cancer screening, perceived barriers to cervical cancer screening, perceived seriousness to cervical cancer, perceived susceptibility to cervical cancer and self-efficacy to cervical cancer screening were the independent variables in this study and are the main constructs of the HBM. The dependent variable, intention toward cervical cancer screening, was derived from the stages of change of the trans-theoretical model. Descriptive statistics were calculated to describe the characteristics of the sample, through frequencies and percentages. Bivariate correlation was used to examine the relationship between each construct of HBM. We present adjusted odds ratios (OR) and 95% confidence intervals (95% CI) from logistic regression analyses. The goodness-of-fit of the model was examined using Hosmer-lemeshow test. Multiple regression analysis was conducted to identify which construct had significance with intention with p-value of 0.05. Those statistically significant constructs were further analyzed using ROC analysis to evaluate the predictability of HBM constructs for intention determined by area under curve with sensitivity and specificity value. The value of AUC ranges from 0-1: where a value of 0.5= No discrimination, 0.5-0.7 = Poor discrimination, 0.7-0.8 = Acceptable discrimination, 0.8-0.9=

Excellent discrimination >0.9 = Outstanding discrimination (111). The level of statistical significance was set at $p < 0.05$.

Ethical consideration

The study received ethical approval from Institutional Review Board of Addis Ababa University with a protocol number 017/20/ before the initiation of the study. Written informed consent was collected from all participants. All potential participants were informed about the purpose, method and expected benefit of the study. As a protection of the rights of the study participants, this consent expressly includes a guarantee that they are free to participate in the study or not to participate. Withdrawal from the study would not affect anything and had no risk or direct benefits. The confidentiality of all participants throughout the research process was maintained by using anonymity of the participants, all information gathered was kept secured and any personal information was not transferred to a third party (Annex I).

Strength and limitations of the study

A strength of the study was the ability to validate a culturally appropriate modified version of the cervical cancer screening and VIA HBM tool that may be used for future studies among Ethiopian women. We examined the predictive power of each subscale of the HBM and its applicability to cervical cancer screening. These results also serve to identify intervention priorities that may be useful to apply to improve cervical cancer screening and perhaps may apply or be adapted for other types of cancer screening. There were also several limitations of this study. Due to of the cross-sectional nature of the data used, the stability of the initial and revised dimension scores over time were not examined. Further, data for the present instrument revision were provided by a sample from a specific population, healthcare professionals; hence, the generalizability of the HBM instrument should be examined in other populations of women in Ethiopia, such as those from rural areas and women who are less educated.

DISSEMINATION OF FINDINGS

The final project report will be presented and submitted to Addis Ababa university, School of Graduate Studies. Abstract was selected for poster presentation to the AAU,2024 research and Health fair week at the College level in TASH and has been presented. The findings of the study will be disseminated through presentation at professional seminars and conferences held at the national and international levels. Many of the findings of this study have already been published on international and nationally peer reviewed journals and disseminated to the scientific community.

I. **Psychometric properties of the modified health belief model for cervical cancer and visual inspection with acetic acid among health care professionals in Ethiopia,** PLoS *One. 2024;19(4)*

II. **Intention to screen for cervical cancer among health care professionals working at the college of health sciences of Addis Ababa University: clued by trans-theoretical model,** *Ethiop. J. Health Dev. 2023; 37(1)*

III. **Health Belief Model ability to predict intention to screen for cervical cancer using visual inspection with acetic acid among female healthcare professionals** *submitted to Psychological Science, SAGE journals.*

CHAPTER II

Article 1: Psychometric properties of a modified health belief model for cervical cancer and visual inspection with acetic acid among healthcare professionals in Ethiopia

Authors:

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Abstract

Purpose: Evidence supports that the Health Belief Model (HBM) can explain and predicts certain health behaviors, including participation in cervical cancer (CC) screening. The purpose of this study was to evaluate the psychometric properties of a modified HBM for CC and visual inspection with acetic acid (VIA) in female healthcare professionals in Addis Ababa, Ethiopia, 2020.

Methods: psychometric properties related to CC and VIA were tested using 42-item modified HBM self-administered questionnaire and a cross-sectional study design with simple random sampling. Kaiser-Meyer-Olkin and Bartlett's sphericity test indicated that data sampling adequacy for exploratory factor analysis was 0.792 ($\chi 2 = 3189.95$, df =351, $p < .001$). Items with cross-loading and factor loadings ≥ 0.5 were retained. Confirmatory factor analysis (CFA) was conducted to determine model fit.

Results: the final analysis included 194 women, (mean age 30±4.34). Twelve items with ≤ 0.5 were removed and 30 retained items loaded into 6 factors; (benefits of VIA, perceived seriousness of CC, barrier (fear of negative outcome), self-efficacy, susceptibility to CC, and barriers (health system delivery)) explained 65% of the total variance. Cronbach's alpha for the total instrument was 0.8 and reliability for the 6 subscales was 0.76–0.92. Composite reliability and average variance extracted indicated good internal consistency and convergent validity. CFA identified 6 additional items to be removed with high residual covariance. The final 24 items of the modified HBM had an acceptable model fit (goodness-of-fit index (GFI)= 0.861, adjusted GFI= 0.823, comparative fit index = 0.937, root mean square error of approximation=0.059).

Conclusion: The modified HBM for CC and VIA with 24 items had adequate psychometric properties and may be used by Ethiopian healthcare professionals for research or clinical purposes. To support external validity the updated 24 items tool is suggested for application in further study in different populations in Ethiopia.

Keywords: Cervical cancer screening, confirmatory factor analysis, exploratory factor analysis, psychometrics

Introduction

The global burden of cervical cancer is projected to continue to increase, rising to approximately 700,000 diagnosed, with an estimated 400,000 deaths in 2030. Most of these increases will be among women in low and middle income countries (LMICs), reflecting the severity of the global divide in cervical cancer morbidity and mortality (1, 2). In LMICs, including Ethiopia, cervical cancer the leading cause of death. In 2010, the Ethiopian Ministry of Health reported that there were 4,648 new cases and 3,235 deaths due to cervical cancer, equating to a mortality rate of 18.4/10000 (4, 58, 112).

Screening is the single most important public health strategy to reduce cervical cancer incidence and consequent mortality (11, 12). Survival rates for cervical cancer in Sub Saharan Africa are 21% compared with 70% in the USA and 66% in Europe (113, 114). Despite the negative clinical outcomes associated with cervical cancer in Ethiopia, approximately 27.19 million women are estimated to be at risk, yet less than 1% of women aged 18-69 years undergo screening every 3 years, as recommended by the World Health Organization (WHO, 2014) and adopted by Ethiopia (10, 74, 115). Effective, low resource screenings and treatment methods are recommended in the WHO guideline, which includes use of "see and treat" screening strategy with visual inspection with acetic acid (VIA) as the primary screening method and cryotherapy as a treatment option (4).

Research to date indicates that the availability of screening services is inadequate to increase screening participation (14, 15, 116). Further some behaviors and beliefs may significantly impact the decisions of women to take preventive actions against cervical cancer (18). Much of the work associated with cancer screening has been informed by the Health Belief Model (HBM). The HBM focuses on preventing illness occurrence by encouraging health behaviors that avoid disease (18). Researchers have reported that diverse demographic, psychosocial, and health beliefs may influence cervical screening perceptions and, thus, indirectly influence health-related behavior (29). To improve screening participation among women, a better understanding of their health beliefs is essential (30).

There is considerable empirical support that HBM can explain and predict certain health behaviors, particularly cancer screening (29). For behavior change to occur such as obtaining cervical cancer screening, people must perceive a threat from their current behavioral patterns (perceived susceptibility and severity) and believe that change of a specific behavior will result in a valued outcome at an acceptable cost (perceived benefit). Individuals also must feel competent (self-efficacy) to overcome perceived barriers to taking action (117).

One of the most important limitations in both descriptive and intervention research regarding HBM has been variability in the measurement of central HBM constructs. Construct definitions need to be consistent with HBM theory as originally conceptualized, and measures need to be specific to the behavior being addressed and relevant to the population among whom they will be applied (118). The reliability of instruments may differ among populations for various reasons, including socio-demographic factors and cultural nuances.

Testing a modified version of the HBM scale modified for cervical cancer and VIA among women in Ethiopia will contribute to and expand knowledge in this area. A survey conducted among Ethiopian healthcare professionals revealed a significant deficit regarding cervical cancer, which could have implications for future screening programs since these providers would likely play a principal role in patient education and implementation of a cervical cancer screening program in Ethiopia (117). Cervical screening behaviors among healthcare professionals working at the College of Health Sciences in Ethiopia have not previously been examined using a modified version of Champion's HBM. Therefore, the objective of this study was to evaluate and validate the psychometric properties of the modified HBM scale for Cervical Cancer and VIA (42) questionnaire in female Ethiopian healthcare professionals.

Methods

Study design and settings

A cross-sectional study design was used to test the psychometric properties of the modified HBM for cervical cancer and VIA for application in female healthcare professionals working at the College of Health Sciences at Addis Ababa University, Ethiopia in 2020.

Sample size

The sampling frame for this study was based on participants' profile obtained from the office of human resource. Simple random sampling was used to select the participants' who fulfills the inclusion criteria being female healthcare professionals aged 21- 65 years, no prior history of cervical cancer, speaks English and employed full-time. For this survey students and non-health care professionals were excluded from the study. Samples were proportionally allocated based on the number of female staffs available in the units/ departments. Health care professionals who fulfil the inclusion criteria and willing to participate were approached face to face to fill out the semi structured questionnaires. For psychometric testing, there are a wide range of recommendations for adequately powered analysis ranging from 3 participants to 1 item to 5:1 (118). In the current study a 5:1 ratio of participants to items was used to perform exploratory factor analysis (EFA). The modified HBM scale to be tested included 42 items, bringing the required number of participants to 210. Given the 24 items in the final modified version presented here the 5:1 ratio increased to 8.75:1.

The study received ethical approval from the Institutional Review Board of Addis Ababa University (protocol number, 017/20/-Nursing) before its initiation. Written informed consent was collected from all participants. All potential participants were informed about the purpose, method and potential benefits and knowledge gained from the study. Data for the psychometric evaluation were collected from June to August 2020.

Instruments

A structured questionnaire was used to collect socio-demographic data including age, marital status, work experience, profession, income and level of education. In addition, questions about prior cervical cancer screening practice were included.

The modified HBM scale for cervical cancer and VIA use

The HBM questionnaire used in the current study was modified from the HBM Scale for Cervical Cancer and Pap Smear Test reported by Guvenac (2011), which had been previously modified from Champion's HBM by inclusion of four additional question to the barrier construct (119). The self-efficacy construct was not tested by Guvenac (2011) and was considered to be a modified HBM scale. The following HBM constructs were included: susceptibility, seriousness, benefits/ motivation, barriers, health motivation, and self-efficacy. The modified HBM scale was further adapted for this study to refer to cervical cancer screening as VIA since the Pap smear is not widely used in Ethiopia. Visual inspection with acetic acid (VIA) is visualization of woman's cervix to detect precursors of cervical cancer after application of acetic acid (ordinary table vinegar) on her cervix and it is a simple, low-cost, and efficient alternative to cytologic testing in low-resource areas (120). The Health Belief Model Scale for Cervical cancer and VIA has 42 items and six subscales, including benefit (8 items), barrier (18 items), seriousness (7 items), susceptibility (3 items), health motivation (3items), and for self-efficacy (3 items). All subscale items have the following five-point Likert-type response choices: strongly disagree (1 point), disagree (2 points), neutral (3 points), agree (4 points), and strongly agree (5 points). Permission to test the modified instrument and to adapt the scale for use by women in Ethiopia was obtained from Guvenac.

Data analysis and presentation

Data were screened for missing and outlier values and data entry errors using the frequency distributions of the variables and by inspection of entered data. Data were exported to SPSS version 25 software for analysis.

Construct validity of the scale was examined using EFA and principal axis factoring (PAF) extraction with oblimin rotation. The loading criterion was set as ≤ 0.3 and Bartlett's tests was used to analyze sampling adequacy. Reliability included internal consistency and was estimated

using Cronbach alpha coefficient values for the different domains of the instrument. Cronbach's alpha between 0.70–0.90 is considered to reflect adequate internal consistency(105).

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was used to quantify sufficiency of item correlation for performing factor analysis. The KMO index ranges from zero to one and, the minimum acceptable value is 0.60. Bartlett test of sphericity test was applied to assess the presence of correlations among variables significant value ($p < 0.05$) indicates the appropriateness of EFA (106). Generally, the results indicated strong factorability and supported conducting an EFA.

Factor extraction analysis was conducted using PAF to determine the number of factors to retain, as follows: (a) using the Guttmann- Kaiser greater-than-one rule which recommends that only those factors with eigenvalues ≥ 1.0 be retained; (b) using the Cattell scree test, which involves constructing 16 plots of extracted factors against their eigenvalues in descending order of magnitude; (c) by applying the Monte Carlo Parallel analysis rule, which compares factor eigenvalues to a set of eigenvalues generated from random data, and recommends retaining those eigenvalues that exceed the corresponding values from the random data; and, (d) by calculating the amount of total variance explained by the communality of each variable to determine the number of factors to be preserved (107). PAF was conducted together with oblique rotation (direct oblimin) which is often seen as producing more accurate results for research involving human behaviors. Regardless of which rotation method is used, the main objectives are to provide easier interpretation of results, and produce a solution that is more parsimonious (108) Items were deleted from the EFA if factor load was < 0.5, loaded on more than one factor, or not loaded on any factor (108).

In confirmatory factor analysis (CFA), model fitness was assessed by (a) over model fitness, using the Chi test $\chi 2$ (p) ($p > 0.05$) and normed (Chi-square and df ratio) $\chi 2$ (CMIN/df) ≤ 3; (b) incremental fitness with comparative fit index (CFI) and normed fit index (NFI) ≥ 0.95 and; (c) absolute fitness with, goodness-of-fit index (GFI), adjusted GFI (AGFI) ≥ 0.80 ,root mean square residual (RMR) ≤ 0.08, and root mean square error of approximation (RMSEA) ≤ 0.06 (109). The method used to potentially further refine /remove items from the instrument was with load <0.3 or, higher covariance, and estimates of the residual variance.

The criteria for convergent validity were as follows composite reliability $\geq \pm 1.97$ ($p < 0.05$); and average variance extracted (AVE) ≥ 0.50 (110).

Participant's demographic characteristics were summarized using descriptive statistics. Categorical variables are presented as percentages and frequencies.

Inclusivity in global research

Additional information regarding the ethical, cultural, and scientific considerations specific to inclusivity in global research is included in the Supporting Information (S39 Checklist).

Results

Socio-demographic characteristics

We approached 210 female participants at the College of Health Sciences. Variables were checked for outliers based on the Mahalanobis distance and 16 cases with $p< 0.001$ were excluded from the analysis resulting a final study sample of 194 female healthcare professionals (response rate 92.4 %) working at Addis Ababa University College of Health Sciences, with mean age $33.14^{\pm}7.2$ years. The majority of participants 150 (77.3 %) worked in the clinics and 102 (52.6 %) had < 5years of work experience. The socio-demographic characteristics of participants are presented in Table 2.

Table 2 Socio-demographic characteristics of health care professionals working in the CHS, AAU, Ethiopia, 2022 (n=194)

Variables	Category	Frequency	Percent %
Age	< 30 Years	101	52.1
	30- 34 years	40	20.6
	35- 39 Years	23	11.9
	≥ 40 Years	30	15.5
Marital Status	Single	76	39.2
	Married	108	55.7
	Others	10	5.2
Service Year	<5 years	102	52.6
	5-10 Years	51	26.3
	>10 years	41	21.1
Educational level	BSc	124	63.9
	Masters	44	22.7
	MD	20	10.3
	Others*	6	3.1
Monthly income (ETB)	≤6193	77	39.7
	6194 – 9056	71	36.6
	>9056	46	23.7
Professional stream	Clinical	150	77.3
	Academic	39	20.1
	Both	5	2.6
Professional title	Nurse	128	66.0
	Midwife	18	9.3
	Physicians	22	11.3
	Others**	26	13.4
Unit of work	Medical ward	29	14.9
	Surgical ward	22	11.3
	Oncology	21	10.8
	Outpatient	44	22.7
	Others***	78	40.2

Note: Others: Widowed and divorced; *: Diploma and PhD; **, anesthetist, pharmacy, laboratory, radiology; *** EPI, FP, etc

Participant screening practice

The majority of the women healthcare professionals 138 (71.1%) enrolled in the study had not been previously screened for cervical cancer in their life time. Only 33 (17.0%) of the sample had been screened for cervical cancer in the past three years and the remaining 161(83.0 %) had not.

Validity and Reliability

The KMO and Barlett tests were conducted done before the EFA. KMO should be 0.6 to continue with factor analysis. In more detail, KMO values with 0.90 are considered excellent; 0.80 good, 0.70 middle range; 0.60 mediocre; 0.50 acceptable; and $\leq$ 0.50 is unacceptable (121). The KMO measurement of sampling adequacy was 0.792, and the Bartlett's test of sphericity was significant ($\chi 2 = 3189.95$, df = 861, $p < .001$) indicating the adequacy of the sample (n=194) for EFA.

The Cronbach's alpha value for total items was 0.80 and the reliability coefficient values calculated for each sub dimension were 0.92 for benefit of VIA, 0.87 for perceived seriousness of cervical cancer, 0.87 for barrier (fear of negative outcome), 0.82 for self-efficacy, 0.76 for susceptibility to cervical cancer, and 0.80 for barriers (health system delivery).

Exploratory factor analysis

Decisions regarding the number of extractable factors included in EFA were made using eigenvalues, factor loadings, and scree plot diagrams. Initial PAF showed the presence of nine factors with eigenvalues > 1. A review of the scree plot revealed a break before four factors. Supporting Catelli's scree test, Monete Carlo parallel analysis showed seven factors with eigenvalues surpassing the corresponding criterion values for a randomly generated data matrix of the same size for ample EFA. Parallel analysis is a consistent and acceptable method used to precisely decide the number of factors (121). Of 42 items30 were retained and total of twelve items were eliminated based on factor loading lower than 0.5, cross-loading, or a communality value < 0.40.

A key component analysis of the scale revealed that six factors had values > 1. Of the factors revealed by oblimin rotation, the first one explained 19.01 % of the total variance, while the second to sixth explained 12.594%, 10.018%, 6.526%, 4.789%, and 4.424% respectively; the variance explained by all six factors was 65%. Factor analysis identified that the first factor, benefits of VIA included 8 items; the second factor perceived seriousness of cervical cancer

had 6 items; the third barrier to negative health outcome had 3 items, the fourth self- efficacy had 5 items; the fifth susceptibility to cervical cancer had 3 items, the sixth barriers to health delivery had 5 items. Items in the health motivation subscale changed sub scale and were loaded on the self-efficacy sub scale, and the barrier sub scale was divided into two factors, while the remaining items remained in their original subscales. Factor load values of the items in the first to sixth factors were: 0.635 to 0.834, while it was 0.602-0.857, 0.571-0.956, 0.553-0.835, 0.585-0.900, and 0.576-0.772 respectively in Table 3.

Table 3: Factor loading for EFA with oblimin rotation Modified HBM for VIA-30 among health care professionals working in the CHS, AAU Ethiopia 2022 (n=194)

ITEM	BEN	SER	BAR 1	EFF	SUS	BAR 2
6 Maintaining good health is extremely important to me	.834					
1 Having regular VIA will help to find changes to the cervix, before they turn into cancer	.826					
I want to discover health problems early	.815					
8 I feel it is important to carry out activities which will improve my health	.797					
3 I think that having a regular VIA is the best way for cervical cancer to be diagnosed early	.757					
7 I look for new information to improve my health	.732					
4 Having regular VIA will decrease my chances of dying from cervical cancer	.720					
2 If cervical cancer was found at a regular VIA test its treatment would not be so bad	.635					
29 I am afraid to think about cervical cancer		.857				
27 The thought of cervical cancer scares me		.802				
28 When I think about cervical cancer, my heart beats faster		.799				
32 If I had cervical cancer my whole life would change		.676				
30 Problems I would experience with cervical cancer would last a long time		.621				
31 Cervical cancers would threaten a relationship with my boyfriend, husband, or partner		.602				
10 I am afraid to have a because I don't know what will happen			.956			
9 I am afraid to have VIA for fear of a bad result			.954			
12 I would be ashamed to lie on a gynecologic examination table and show my private parts to have a VIA			.571			
41 I feel capable of getting a VIA test.				.835		
42 I feel capable of managing any emotional distress caused by VIA test				.792		
40 I feel capable of arranging to have a VIA test.				.641		
38 I exercise at least 3 times a week for my health				.603		
39 I have regular health check-ups even when I am not sick				.553		
36 I feel I will get cervical cancer sometime during my life					.900	
34 It is likely that I will get cervical cancer in the future					.680	
35 My chances of getting cervical cancer in the next few years are high					.585	
25 My partner does not want me to get VIA						.772
26 It is difficult to get an appointment for VIA						.751
22 I will never have a VIA if I have to pay for it						.630
24 The VIA may move the intrauterine device						.577
23 I do not have time to get VIA						.576

Note, n = 194. Factor loadings > .5 only presented. BEN: Benefit of VIA, SER: Perceived seriousness of cervical cancer, BAR 1: Barrier fear of negative outcome, EFF: Self-efficacy, SUS: Susceptibility to cervical cancer, BAR 2: Barrier to health delivery

To check internal consistency Cronbach's alpha and composite reliability coefficients calculated for the six factors. In addition, AVE values were estimated to assess convergent validity. Both alpha and composite reliability ≥ 0.70 and AVE ≥ 0.5 reflect adequate internal consistency and convergent validity. Cronbach's alpha, composite reliability, and AVE values were calculated for each factor, and good values were obtained for all subscales in Table 4.

Table 4 Cronbach's alpha, composite reliability and AVE for each factor of modified HBM for cervical cancer and VIA among health care professionals working in the CHS, AAU Ethiopia 2022 (n=194)

Factor name	**No of items**	**α Cronbach**	**CR**	**AVE**
	30 items (item11,13,14,15,16,17,18,19,20,21,33,37 removed)			
Benefits of VIA	8	0.92	0.92	0.59
Perceived Seriousness of cervical cancer	6	0.87	0.87	0.54
Barrier Fear of negative outcome	3	0.87	0.88	0.72
Self-efficacy	5	0.82	0.82	0.48
Susceptibility to cervical cancer	3	0.76	0.77	0.54
Barrier Health delivery	5	0.80	0.80	0.44
	26 items (item7, 5, 39 and 22 removed)			
Benefits of VIA	7	0.90	0.91	0.58
Perceived Seriousness of cervical cancer	5	0.86	0.86	0.56
Barrier Fear of negative outcome	3	0.86	0.88	0.72
Self-efficacy	4	0.82	0.83	0.56
Susceptibility to cervical cancer	3	0.76	0.78	0.55
Barrier Health delivery	4	0.75	0.78	0.48
	24 items (item23 and 38 removed)			
Benefits of VIA	7	0.90	0.91	0.58
Perceived Seriousness of cervical cancer	5	0.86	0.86	0.56
Barrier Fear of negative outcome	3	0.86	0.88	0.72
Self-efficacy	3	0.88	0.88	0.71
Susceptibility to cervical cancer	3	0.76	0.77	0.54
Barrier Health delivery	3	0.79	0.79	0.56

Note: (N=194), CR, composite reliability**, AVE** Average Variance Extracted

Confirmatory factor analysis

Based on EFA conducted out in the initial phase, a six-factor model of the modified HBM and VIA questionnaire was evaluated using a randomly allocated sample (N=194) by CFA. conducting confirmatory factor analysis with 30 items, which offered valuable evidence about scale stability. We removed a total of 4 items that showed higher covariance in the standardized residual covariance matrices during CFA; item 1 from the perceived benefit factor, item 22 from perceived barrier towards health delivery, item 30 from perceived seriousness and item 39 from perceived self-efficacy. The factor scores for each construct were positively correlated with one another. Each item of the construct was correlated expressively at ≥ 0.5 except for two items (item 23 and 38). EFA was run again and two items were loaded < 0.5; 0.453 and 0.449 for items 23 and 38, respectively. Removing the item improved the model fit. For the study population, item to factor correlation analysis showed that the modified version of HBM with 24 items was a valid model.

The maximum likelihood ratio was used to estimate model fitness and the $\chi 2$ test was used as a measure of fit between the sample covariance and fitted covariance matrices, $\chi 2 = 472.336$, df = 284 ($p > 0.05$), normed $\chi 2$ (472.336/284) =1.663 which is ≤ 3. The GFI was 0.839, and AGFI 0.803, both of which were acceptable ≥ 0.80.

In addition to the X^2 test, other fit indices were used to evaluate model fitness, including the CFI = 0.927 and NFI = 0.833 (≥ 0.90), RMR=0.060 (≤ 0.08) and RMSEA=0.059 (≤ 0.06).

These data all demonstrate an acceptable model fit, except for the NIF. All indices were within limits and with significant fit. Generally, tests of the goodness-of-fit of the model were conducted, as summarized by Gaskin, J. & Lim, J. (2016), in the, "Model Fit Measures," AMOS Plugin, and indicated an excellent model fit (122) in Table 5 and Fig 2.

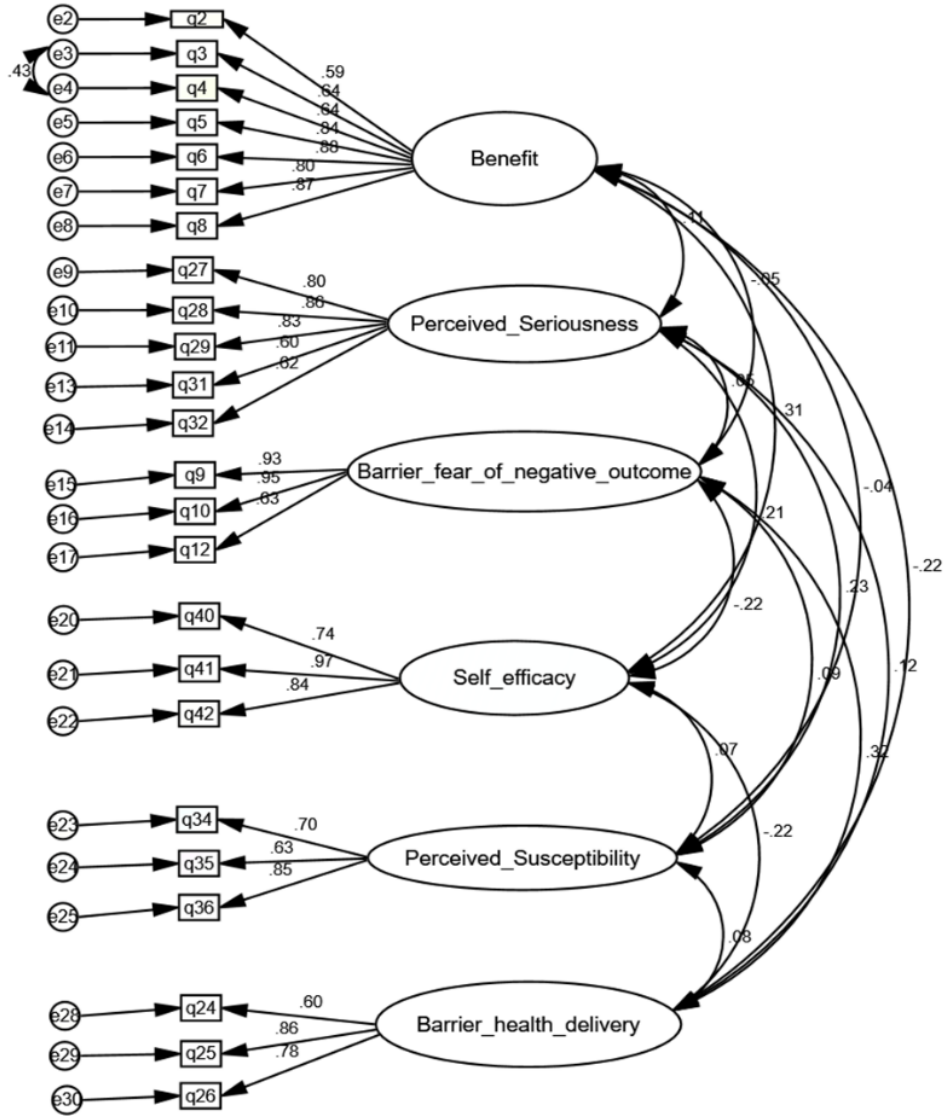

Figure 2 Six-factor structure of modified HBM for cervical cancer and VIA among health care professionals working in the CHS, AAU, Ethiopia 2022 (n=194)

Table 5 Goodness fit indices of the modified HBM for cervical cancer and VIA among health care professionals, working in the CHS, AAU, Ethiopia, 2022 (n=194)

Measure	Estimate	Threshold	Interpretation
CMIN	396.584	--	--
DF	236.000	--	--
CMIN/DF	1.680	Between 1 and 3	Excellent
CFI	0.937	>0.95	Acceptable
SRMR	0.059	<0.08	Excellent
RMSEA	0.059	<0.06	Excellent
PClose	0.067	>0.05	Excellent

Note: CMIN: Chi-square; **DF**: Degree of freedom; **CFI:** comparative fit index; **SRMR:** standardized root mean square; **RMSEA**: root mean square error of approximation

Discussion

The HBM has been used in many studies to create measurement tools to identify factors that influence health behaviours across various health conditions and populations. In this study, we evaluated the validity and reliability of a modified HBM for cervical cancer and screening using VIA among female healthcare professionals employed in a large tertiary academic health sciences center. CFA, found that 24 items loaded on six factors. The results revealed that this instrument is suitable to evaluate beliefs regarding cervical cancer screening for a sample of Ethiopian healthcare professionals. Other studies have evaluated the psychometric properties of HBM-related measures associated with HPV vaccination and screening using either exploratory or confirmatory factor analyses to evaluate the factor structures underlying HBM (119). Most studies retained between 4 and 5 factors which is very close to the findings of the present study in which 6 factors were retained and discrepant with one other study, which yielded a 10-factor structure (123).

The revision of the original 42-item instrument presented here resulted in a shorter yet equally comprehensive basis for measuring HBM constructs. Although the initial 42-item instrument had adequate psychometric properties, the conciseness of the revised version translates into a reduced respondent burden, which may help to enhance survey completion rates in clinical settings. In this case, the instrument was reduced by 18-items (42.9 %) with apparently minimal loss of information, if any; however, validation of the reduced instrument in different samples is still necessary and should be the focus of future work.

A few studies have used either exploratory or confirmatory factor analyses to evaluate the factor structures underlying HBM. The subscale reliabilities for these studies varied considerably. Cronbach's alpha ranged from 0.55 in Marlow et al. (2009) to 0.96 in Kahn et al. (2008) and the value for all subscales in this study was 0.806 which is within this range (124, 125) . The internal consistency and reliability of the shortened version of the scale remained strong. The lowest alpha value (0.7) was for susceptibility to cervical cancer, which had only three items. Other psychometric studies of health motivation sub scales have also reported lower reliability using 3-items (119). The number of items in a subscale has an impact on Cronbach's alpha. Thus, the fact that the lowest alpha was > 0.70 for a subscale with three items is promising, as lower item burden is associated with higher participation compliance. Thus, our data suggest that the reliability of the revised HBM scale for cervical cancer and VIA is acceptable and warrant further testing in other samples of Ethiopian women.

Based on the results of EFA, all questions were clustered in the subscales: benefit of VIA, perceived seriousness of cervical cancer, barrier to fear of negative outcome and health delivery, self-efficacy, susceptibility to cervical cancer and barriers to health delivery subscales. All subscale questions had an acceptable load factor, separately loaded on the related factor. For example, all questions of the self-efficacy scale were loaded on one factor, similar to a method used by authors of a study on the Iranian version of Champion's Revised Health Belief Model Scale for Breast Cancer screening. Decision-making and health behaviour could be influenced by fear theory where it interacts with other components of the HBM to promote healthy behaviour.

According to the results of EFA, three items of the health motivation subscale, namely; question 37, "I eat well-balanced meals for my health; question 38, "I exercise at least three times a week for my health; and question 39, "I have regular health check-ups even when I am not sick, question 39". Question 37 was unsatisfactory among healthcare providers, consistent with the results of a study of Iranian female students. The remaining two questions were loaded to the self-efficacy factor. Contrary to some previous findings, all items related to the health motivation subscale were loaded on one factor (126).

Under the construct for barrier variables like 'It is difficult to get an appointment for VIA'; so, creating modalities to have short waiting list in the clinicals could be a solution to improve screening practice in the clinical area and enhance early detection to minimize cancer related deaths. As the same time this finding implies for researchers to work on the feasibility of the different screening techniques for cervical cancer like self-testing kits and its efficacy as our

finding revealed 'I would be ashamed to lie on a gynecologic examination table and show my private parts to have a VIA' researchers may be interested to look in the feasibility, acceptability of the different screening techniques to optimize screening utilization in the general population the case of Ethiopian women.

Although, there was a difference from the original HBM 42 in the number of items and factor structure, CFA was conducted to assess whether the six -factor EFA measurement was appropriate for the study population. CFA revealed that each item had acceptable loading with its factor. All factors had a good inter-factor correlation and measured similar concepts with acceptable model fit indices.

Study strengths and limitation

A strength of the study was the ability to validate a culturally appropriate modified version of the cervical cancer screening and VIA HBM tool that may be used for future studies among Ethiopian women. There were also several limitations of this study. Due to of the cross-sectional nature of the data used, the stability of the initial and revised dimension scores over time were not examined. Further, data for the present instrument revision were provided by a sample from a specific population, healthcare professionals; hence, the generalizability of the HBM instrument should be examined in other populations of women in Ethiopia, such as those from rural areas and women who are less educated.

Conclusion and recommendations

In conclusion, the revision of the 42-item adapted version of the HBM for VIA instrument provided a validated and more parsimonious short- form instrument (24-items) that, in the available sample of health care professionals, appeared to retain the psychometric properties of the original instrument. Directions for future research include testing the instrument in other populations of Ethiopian women. In addition, future studies may consider adapting the modified HBM scale for VIA to examine perception towards cervical cancer and possible barriers that influences screening behaviours. Assessing the perceptions of women about screening and perhaps helping to evaluate interventions to increase screening in LMICs, such as Ethiopia. Future studies comparing the original 42-item and updated 24 items tool with external measures to support external validity of each construct and subscale will be beneficial and provide greater understanding of the psychometric properties of the tool.

Chapter III

Article 2: Intention to screen for cervical cancer and factors associated among female healthcare professionals using the trans-theoretical model: Addis Ababa, Ethiopia

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Abstract

Background: Healthcare providers can serve as role models to facilitate a supportive environment that encourages women to utilize screening for cervical cancer. Equally important is that being a female healthcare professional does not prevent the risk of cervical cancer. Therefore, this study aims to assess the intention of screening with visual inspection of acetic acid (VIA) and its determinants among female healthcare professionals (HCPs), guided by the trans-theoretical model (TTM) of stages of behavior change.

Method: A cross-sectional study design was used to test readiness for cervical screening among selected female HCPs. A structured, self-administered questionnaire was used to collect data. The analysis included descriptive statistics and logistic regression.

Result: Four hundred sixty female HCPs with a mean age of M=33.8, +5 years participated. The intention to participate in cervical cancer screening was 44.1%. Over (half 52% of the participants) had poor knowledge of cervical cancer and screening. Regarding the TTM stages of change, 46.5% of participants indicated being in the pre-contemplation phase, suggesting they had never a VIA screen and had no intention of being screened within the next six months. In the final logistic regression model, four factors, including age, being screened in the past three years, taking care of patients with cervical cancer, and having good to moderate knowledge of cervical cancer and screening, were statistically significant, with large odds ratios for their association with intention to screen.

Conclusions: Most of the participants were in the pre-contemplation phase, and the limited knowledge health workers had about cervical cancer screening is worrisome. Intervening in the factors that affect intention for screening is vital to reducing barriers to cervical screening among female healthcare workers as well as the broader female population in Ethiopia. Providing cancer screening guidelines to all HCPs, regardless of their specialty, could be a key factor in lessening the burden of cervical cancer.

Keyword: Intention, trans-theoretical model, health care professionals, visual inspection with acetic acid

Introduction

Cervical cancer is a global health concern (127). Worldwide, cervical cancer ranks as the fourth most common malignancy in women, with more than half a million women diagnosed annually and contributing to over 300, 000 yearly deaths (128, 129). Approximately 85% of the worldwide deaths from cervical cancer occurs in developing countries, and the death rate is 18 times higher in low- and middle-income countries (LMICs) compared with developed countries (129) . There are an estimated 7,000 new cases of cervical cancer in Ethiopia annually; with nearly 5,000 deaths reported (130).

Detection of cervical cancer at an early stage is associated with excellent survival but most women in developing countries present with advanced and often untreatable disease, with very low survival rates (131). The disease is largely preventable if regular screening is performed. Regular screening is the single most important public health strategy to reduce cervical cancer incidence and subsequent mortality (12). Approximately 90% of cervical cancers occur in LMICs that lack organized screening programs. In high-income countries, cervical cancer incidence and mortality have been reduced by 50% over the past 30 years since the introduction of formal screening programs (128). Despite the negative clinical outcomes associated with cervical cancer in Ethiopia, approximately 27.19 million women are estimated to be at risk. Less than 1% of women between the ages of 18-69 years receive the recommended screening every 3 years as recommended by WHO (2014) and adopted by Ethiopia (10, 74, 115). Effective, low resource screenings and treatment methods are recommended in the WHO guideline which includes using a "see and treat" screening strategy with visual inspection with acetic acid (VIA) as the primary screening method and cryotherapy as a treatment option (4).

Although the importance and effectiveness of cervical cancer prevention with screening is well established the underlying reasons explain why the majority of women are not utilizing available screening services have not been well described. Low levels of awareness and poor knowledge coupled with a lack of available cervical cancer screening (CCS) services are likely responsible for the very small number of women being screened (115).

The low prevalence of early cervical cancer screening and limited access to its treatments are largely attributed to differences in diagnosis and subsequent mortality from the disease in low-income countries. Given the poor screening status of women in Ethiopia, calls for addressing these missed opportunities for CCS have been made by responsible stakeholders. Healthcare workers are at the core of efforts to improve screening uptakes. Evidence demonstrates that health care provider recommendation is a key driver of CCS uptake especially in situations where an individual's motivation may be inadequate (132). Certainly, health care providers as

role models in healthcare system are expected to facilitate a supportive environment that encourages women to utilize screening.

Research to date indicates that the availability of screening services alone is inadequate to increase screening participation (74, 133). From a social cognitive perspective, an important implication is that different cognitions may be important at different stages in promoting health behaviours (134). Several theoretical perspectives could be used to explore the determinants of the healthcare professionals' behaviours. Consequently, it would be useful to obtain a better understanding of the individual mechanisms of the adoption of new behaviours from social cognitive theories (135). Some behaviours and beliefs may have a significant impact on the females' decision to take preventive actions against cervical cancer (13). Intentions are states in which the person is set to act. Being in the intention state takes one closer to the health behaviour action (136). To address intention which changes with time and to avoid subjectivity we used the trans-theoretical model to determine the stages of change and intention of cervical cancer screening with visual inspection using acetic acid (VIA). The trans-theoretical model (TTM) of behaviour change was used to address the stages of readiness to practice regular cervical screening among female healthcare workers in Ethiopia (19).

The stages of change theory is one of the most important theoretical frameworks that is useful in assessing an individual's readiness to perform a variety of health behaviours, including screening (137). Research demonstrates that intention was a valid proxy measure for behaviour among clinicians (i.e., physicians, nurses, pharmacists, and other health workers) (135) .Women can be described along a series of stages of readiness to practice regular VIA test screening: (a) pre-contemplation: never had a VIA test and no intention to have one within the next 6 months; (b) contemplation: never had a VIA test but intends to have one within the next 6 months; (c) preparation: never had a VIA test but intends to have one within the month; (d) action: had one VIA test in the past year and intends to continue getting regular VIA tests; (e) maintenance: had regular VIA tests and intends to continue to do so; (f) relapse risk: on schedule, but no intention to get one in the future; and (g) relapse: had VIA tests in the past, none in the last 3 years, and does not intend to get one(19).

Health behaviour change is associated with changes in self-beliefs and self-regulatory skills (138). First, in terms of behavioural intentions, research has shown consistently that the intention to perform a behaviour can be translated into actual behaviour. For example, research indicates the intention to attend for cervical or breast screening activities predicts actual attendance (138). Also, understanding the competing and motivating factors affecting the CCS behaviour among women in the context of Ethiopia helps to enhance the screening and

treatment efforts. Cervical screening among female healthcare professionals guided by the TTM has not been previously examined in Ethiopia. Researching the intention, and looking into pre-existing factors towards intention of screening among health care professionals at Addis Ababa University College of Health Sciences will contribute to the existing knowledge and bridge the gap to low cervical screening participation and hopefully lead to decrease morbidity and mortality of the problem. Also, for effective screening and prophylaxis, it is of utmost importance to understand the intention of the healthcare staffs as they constitute an important source for communicating health-related information.

Methods

Study setting

The study took place at the College of Health Sciences (CHS), Addis Ababa University. In the college there were 3017 permanently employed staff with 913 academicians (683 male and 230 female), 1204 hospital health staffs (457 male and 747 female) and 900 administrative staffs. The setting was selected as it is the only teaching and health service provision area inclusive with the greatest healthcare professionals to better meet the aim of the study.

Study design

An institutional based cross-sectional study design was used to describe the intention of cervical cancer screening among health care professionals working at the CHS, Addis Ababa University using the stages of change described in the trans-theoretical model and to determine the pre-existing factors affecting the intention of cervical cancer screening.

Source and study population

All health care professionals working in the CHS of AAU were source populations and HCP aged 30years and above were the study populations.

Sampling techniques and sample size estimation

The sampling frame for this study was based on participants' profile obtained from the office of human resource. Samples were proportionally allocated based on the number of female staffs available in the units/ departments. Health care professionals who fulfil the inclusion criteria were approached face to face and also using online platforms of the CHS to fill out questionnaires; those available and willing filled out the self-administered questionnaire. Sample size was determined using Epi INFO STAT Calc. sample calculation for population survey; by considering the expected frequency of 25%obtained prevalence of cervical cancer screening practice from a study on cervical cancer screening knowledge and barriers among women in Addis Ababa, Ethiopia (116). Assuming population size 977, 3% marginal error (d),

95% confidence interval, hence n= 440. The total sample size by adding 10%non-response rate was n = 484. A total sample of 484 female healthcare professionals 30 years of age and older working at Addis Ababa University- CHS were included in this study. Students and non-health care professionals working at the study setting were excluded from this study. Data were collected from December 2020 to January 2021.

Instrumentation

A structured self-administered instrument was used to collect data from participants'; the instrument was adapted from previous studies. It contained questions about:

Data Processing and Analysis

Data were entered and cleaned using Epi Data software version 3.1 and exported to SPSS version 25 for statistical analysis. Descriptive statistics such as means and standard deviations and frequencies were calculated. Contributions of the predictors of the outcome variable intent to screen for cervical cancer were examined by performing a logistic regression analysis. Multicollinearity was checked using tolerance and variance inflation factor (VIF). Variables with p-value < 0.2 during the bivariate analysis considering each predictor one at a time were included in the final model. Multiple logistic regression analysis was computed to consider the conditional effects of factors. Crude odds ratios (COR) were computed for each predictor one at a time for the outcome. Adjusted odds ratio (AOR) and 95% confidence intervals (CI) were constructed to measure the strength of association between the intent to screen for cervical cancer and the selected predictors combined together in the final logistic regression model. For all statistical tests, p-value ≤ 0.05 was considered statistically significant.

Ethical consideration

The study received ethical approval from the Institutional Review Board (IRB) of Addis Ababa University with a protocol number 017/20/Nursing before participants were approached or data collected. Written informed consent was obtained from all participants and confidentiality of information was maintained.

Results

Socio-demographic characteristics

A total of 484 questionnaires were distributed to study participants. Twenty-four participants failed to return their questionnaire and were excluded from the study. This resulted in a study population of 460 female health care professionals with a response rate of 95% working at Addis Ababa University, CHS. The mean age M=33.8, ±5.3 years. Majority of the participants were nurses 281 (61.1%) and 271 (58.9%) had less than 5years of work experience as shown in Table 6.

Reproductive health history, lifestyle and clinical practice of respondents

The mean age of sexual intercourse was M= 21.75, 95% CI [21.26, 22.24]. Hundred (21.7%) of the participants had multiple sexual partners. Approximately 33.7% (155), of the study participants have ever given birth and ever use of condom was 68.3% (314). Regarding lifestyle half of the respondents 230(50%) ever used alcohol. In relation to clinical characteristics only 110(23.9%) participants had been ever screened for CC and among these 74(67.3%) had received CC screening in the past three years as shown in Table 6.

Table 6 Socio-demographic, medical history, clinical practice and life style characteristics of health care professionals working in the CHS, AAU, Ethiopia (n=460)

Variable	Category	Frequency	Percent %
Age in Years M=33.88, SD=5.29	30 – 34	323	70.2
	35 – 39	88	19.1
	40 – 44	20	4.3
	≥45	29	6.3
Marital status	Never married	230	50.0
	Married	206	44.8
	Widowed and divorced	24	5.2
Service in years M=6.71, SD=6.03	< 5	271	58.9
	5 -10	126	27.4
	>10	63	13.7
Educational level	BSc	294	63.9
	MD	49	10.7
	MSc and above	117	25.4
Monthly income in Ethiopian birr M=7704, SD=5564	<6193	193	42
	6194–9056	171	37.2
	>9056	96	20.9
Professional stream	Clinical	385	83.7
	Academic	75	16.3
Professional title	Nurse	281	61
	Midwife	39	8.5
	Physician	55	12
	Others*	85	18.5
Unit of work	Oncology	55	12
	Medical-Surgical	356	77.4
	Outpatient	28	6.1
	Others**	21	4.6
Age at first sexual contact n= 411 M=21.75, SD=3.455	12 -21 years	218	53
	>21 years	193	47
Ever had multiple sexual partner	Yes	100	21.7
Ever use condom	Yes	314	68.3
Ever drink alcohol	Yes	230	50
Ever use substance (chat chewing)	Yes	28	6.1
Ever smokes cigarette	Yes	28	6.1
Ever used oral contraceptives	Yes	107	23.3
History of STI	Yes	20	4.3
Ever gave birth	Yes	155	33.7
Know someone diagnosed with CC	Yes	113	24.6
Ever taken care of a patient with CC	Yes	153	33.3
Ever been screened for CC	Yes	110	23.9
Screened for CC in the past 3 years	Yes	74	67.3

***:** pharmacist, anesthetist, laboratory technicians, lecturers**, **:** EPI, ER, GYN**, CC:** cervical cancer**: STI:** sexually transmitted infection

Knowledge of cervical cancer and screening

The majority 275(59.8%) of the respondents did not regard "Visual inspection with acetic acid (VIA)" as one of the screening methods of cervical cancer. Regard to screening frequency, the majority 357 (77.6%) and 454 (98.7%) of the participants mis-identified to be "every year" and "every 10 years" respectively. Health care professionals in this study had a mean knowledge of M=15.63, +SD 3.14, out of a possible range of 0 to 28. Based on knowledge scores, 239(52%) of the respondents had poor knowledge regard to cervical cancer and screening. The source of information regarding cervical cancer for more than three quarters of the respondents 363 (78.7%) was regular course work and 64 (13.9%) participated in additional trainings refer to Table 7 and Figure 3.

Table 7 Frequency of correct answer for items about knowledge on cervical cancer among health care workers in the CHS, AAU, Ethiopia (n=460)

Items	Frequency	Percent %
Cervical cancer sign and symptom (0-5) *		
1. No symptoms in early-stage	181	39.3
2. Post-coital bleeding	295	64.1
3. Post-menopausal bleeding	248	53.9
4. Dyspareunia	179	38.9
5. Increased vaginal discharge	193	42
Risk factors (0-5) *		
1. Multiple sexual partners	370	80.4
2. Multiple pregnancies	130	28.3
3. Tobacco smoking	234	50.9
4. Long-term OCP use	191	41.5
5. HPV infection	306	66.5
Prevention of cervical cancer (0-8) *		
1. No multiple sexual partners	325	70.7
2. Avoiding multiple pregnancies	124	27
3. Use of condom instead of long-term OCP	183	39.8
4. Avoiding early marriage/early sexual debut	133	28.9
5. HPV immunization	367	66.7
6. Regular cervical screening	297	64.6
7. Proper treatment of sexually transmitted infections	251	54.6
8. Treatable if detected early	435	94.6
Cervical cancer screening *		
Available screening test (0-3)		
1. Pap smear test	320	69.6
2. VIA (Visual inspection with acetic acid)	285	40.2
3. HPV (Human papilloma virus) test	251	54.6
Ideal time to screen (0-1)		
1. At age of 21 or three years after sexual debut	382	83
Screening interval (0-4) *		
1. PAP test: every three years at ages 21-29 years	305	66.3
2. Co-testing (HPV and Pap): Every five year at age of 30-65 years	315	68.5
3. Pap alone: Every three year at age of 30-65 years	414	90
4. HPV alone: Every five year at age of 30-65	341	74.1
Time to stop cervical cancer screening (0-2)		
1. Aged > 65 years with adequate screening history	174	37.8
2. Women who have had a total hysterectomy	122	26.5
Total knowledge score for cervical cancer and screening (0-28) M= 15.63, SD=3.14		
Good knowledge (23-28, 80-100%)	18	3.9
Moderate Knowledge (16-22, 60-79%)	203	44.1
Poor knowledge (<16, <60%)	239	52

*Multiple response was possible, **OCP**: oral contraceptive, **Pap:** Papanicolaou smear test

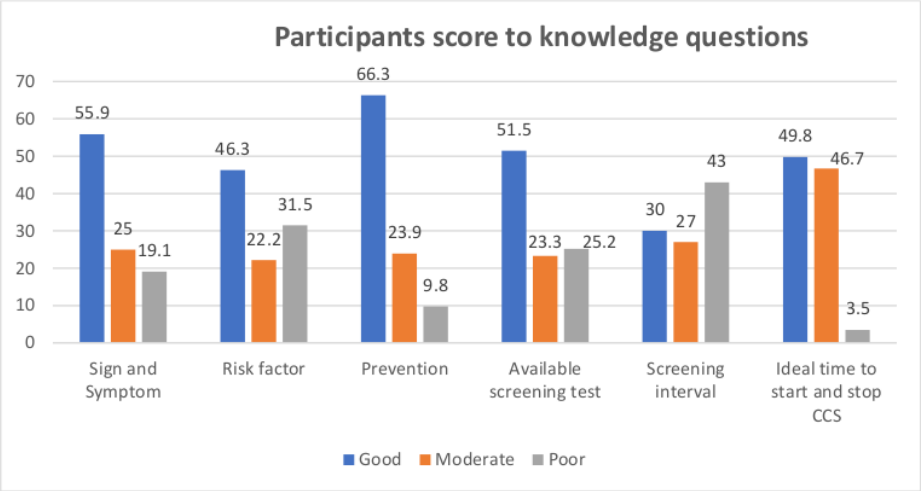

Figure 3 Graphical presentation of knowledge score on cervical cancer and screening among health care professionals working in the CHS, AAU, Ethiopia (n=460)

Intention to participate in cervical cancer screening using TTM stages of change

Two-hundred-fourteen (46.5%) of the study participants were in the pre-contemplation phase; never had a VIA and no intention to have one within the next six months. From the participants: 76(16.5 %) were at contemplation phase, 43(9.3%) at preparation phase, 39(8.5%) were in the action and 45(9.8%) were in the maintenance where participants intend to have screening within six-month, month and continue to get regular screening respectively. The overall intention among female health care professionals was 203(44.1%). More than half 257(55.9 %) of the participants had no intention to screen for cervical cancer see Table 8.

Table 8 Trans theoretical model stages of change classification on intention to screen for cervical cancer (VIA) among female health care professionals working at CHS, AAU, Ethiopia (n=460)

Stages of change	Description	Frequency	Percent %
Precontemplation	Never had a VIA and no intention to have one within the next six months	214	46.5
Contemplation	Never had a VIA but intends to have one within the next six month	76	16.5
Preparation	Never had a VIA but intends to have one within the month	43	9.3
Action	Had one VIA in the past year and intends to continue getting regular VIA	39	8.5
Maintenance	Had regular VIA and intends to continue to do so	45	9.8
Relapse risk	On schedule, but no intention to get one in the future	23	5.0
Relapse	Had VIA in the past, none in the last three years, and does not intend to get one	20	4.3

Factors associated with intention to screen for cervical cancer

In bivariate analysis (considering each factor one at a time relative to intent to screen for cervical cancer), the following factors from socio-demographic items (monthly income, marital status, service year, educational level, age, unit of work, professional stream), reproductive history (oral contraceptive use, history of sexually transmitted infections, ever gave birth, sexual experience status, ever been screened and being screened in the past three years), clinical (know anyone diagnosed with cervical cancer, history of caring for a patient with cervical cancer) and knowledge of cervical cancer and screening showed significance value at p value < 0.2. In the final logistic regression model, we found that only four of the variables, namely participants age, being screened in the past three years, took care of patient with cervical cancer and knowledge of cervical cancer and screening had a significant association with intention to screen for CC at p-value <0.05 shown Table 9.

Participants in the 30-34- and 35-39-years age group were 91.6 % and 83 % less likely to have an intention to receive screening for CC [AOR (95 % CI) =0.084, (0.021, 0.342)] [AOR (95% CI) = 0.167, (0.039, 0.703)] respectively compared to those who were 45 years old and above.

The odds of having intention to screen for CC was 3. 4 times higher among participants who took care of patient with cervical cancer than those who didn't have history of care to CC patient [AOR (95% CI) =3.361, (2.074, 5.445)]. Similarly, health care providers who have been screened in the past three years were 13 times more likely to have intention to screen [AOR (95% CI) =13.124, (5.559, 30.984)] than their counterparts who have not been screened.

The odds of having intention to screen for CC among participants who had good knowledge was 4.8 [AOR (95% CI) =4.758, (1.339,16.906)] and with moderate knowledge was 2 times higher [AOR (95% CI)] =2.280, (1.412,3.681)] than those with poor knowledge.

Table 9 Factors associated with intention of cervical cancer screening with VIA among female health care workers working at the CHS, AAU, Ethiopia (n=460)

Variables	n (%)	Intention to screen for CC		OR (95% CI)		P-value
		Yes	No	COR (95%CI)	AOR (95%CI)	
Age in years						
30-34	323(70.2)	116(57.1)	207(80.5)	.13(.06-.28)	**.084(.021-.342)**	**.001**
35-39	88(19.1)	47(23.2)	41(16)	.13(.06-.31)	**.167(.039-.703)**	**.015**
40-44	20(4.3)	14(6.9)	6(2.3)	.23(.09-.54)	.204(.037-1.84)	.069
≥45	29(6.3)	26(12.8)	3(1.2)	1	1	
Screened in the past three years						
Yes	74(16.1)	67(33)	7(2.7)	17.59(7.85-39.39)	**13.124(5.559-30.984)**	**.000**
No	386(83.9)	136(67)	250(97.3)	1	1	
Took care of patient with CC						
Yes	153(33.3)	105(51.7)	48(18.7)	.44(.28-.68)	**3.361(2.074 - 5.445)**	**.000**
No	307(66.7)	98(48.3)	209(81.3)	1	1	
Knowledge of CC and screening						
Good	18 (3.9)	13(6.4)	5(1.9)	6.03(2.07-17.54)	**4.758(1.339-16.906)**	**.016**
Moderate	203 (44.1)	118(58.1)	85(33.1)	3.22(2.17-4.76)	**2.280(1.412-3.681)**	**.001**
Poor	239 (52)	72(35.5)	167(65)	1	1	

CC: cervical cancer, **COR:** Crude Odds Ratio, **AOR:** Adjusted Odds Ratio

Discussion

This study found that less than half of the female healthcare professionals surveyed had intention to undergo cervical cancer screening. Factors that predicted a greater likelihood of those who would undergo CCs included older age group and previous experience including those who had been screened in the past three years, and previously provided care to a cervical cancer patient. Also, the intention to screen was more likely among those who had better knowledge of cervical cancer and screening.

Intention to be screened for CC was low with over 50% indicating they had no intention of being screened. These findings are similar to a previous study conducted among Ethiopian women who reported intention for cancer screening was 45.3% (139). In other study from Southwest Ethiopia attending a gynaecology out-patient clinic revealed that only 29.9% had an intention to get screened (66). These finding suggest that CCS rates are exceedingly low in Ethiopia and whether specialist care improves rates remains an area for further research.

Studies have documented that several demographic factors contribute to the low uptake of cervical screening (140).Results from this study revealed that cervical cancer screening

intention was associated with age. Intention of health care professionals in their 30's (30-39 years) had a 99 % less probability of having VIA screening compared to women 45 years and above. These findings are supported by studies in Nigeria, Botswana and Addis Ababa, Ethiopia showing a significant association between increasing age of respondents and uptake CCS (141). A systematic review study conducted in Nigeria among female health care providers documented increasing age as a facilitator to screening (142). Study findings from Australia, India, and Ethiopia have also indicated that a woman's age is a major predictor for participating in CCS (4, 143). Older participants were more likely to undergo an annual health check, and could sought out and read health promotion material compared to younger participants (144). Exploration of age differences in health behaviours is an important step towards an understanding of preventive practices and future education needs in Ethiopian women. Herbert et al 2008 found delaying the age of cervical screening increases the risk of cervical cancer becoming more extensive and in advanced stage which is more difficult to treat (145). It would seem prudent for regular screening to begin at an earlier age and attending screening schemes may provide an excellent opportunity for education on preventive health care.

It is well established that knowledge does not always translate into behaviour but improved knowledge has been found to increase the rate of cervical cancer screening in most research settings (146). Current research showed health professionals knowledge is implicated in screening uptake; those who have good or moderate knowledge of CC and screening were more likely to participate in screening. This is supported by a study in Ethiopia that women with better knowledge about cervical cancer and its screening were 2.3 times more likely to utilize screening services than women who were not knowledgeable (4). Cervical cancer screening uptake in Sub-Saharan Africa: a systematic review and meta-analysis; a meta-analysis of seven studies revealed that knowledge about cervical cancer screening was significantly associated with cervical cancer screening (147). Studies conducted in Tanzania and Botswana also found that greater knowledge of cervical cancer and its prevention increased the odds of screening uptake about 9 and 3 times respectively (148, 149). Studies carried out in China reported that women who were willing to undergo CCS had higher knowledge levels (21, 31). A study among child bearing women in Ethiopia disclosed that respondents' with poor knowledge were significantly less likely to seek preventive health measures or control of cervical cancer (150). Also, a systematic review study conducted in Uganda marked that adequate knowledge of at least one screening method was significantly associated with having been screened or having intention to screen (151).

Health providers play numerous roles in the overall wellbeing of their patients. In addition to providing assistance with physical needs, health care providers offer advice and direction for illness prevention and injury. The low knowledge level of cervical cancer and screening found in this study is surprising considering the profession of the respondents, as they are expected to be more knowledgeable than other women in the community. Training among study participants in relation to CC was low and may play an important role in the knowledge gap concerning CCS. Countries wishing to implement new, or strengthen existing, cervical cancer prevention programs must build local capacity to do so. By necessity, these countries generally rely on in-service training of existing providers, which is the most efficient way to quickly generate sufficient numbers of competent providers (152). In-service training is essential to develop a sense of efficiency and effectiveness of one's own capability to engage in health promotive strategies including regular CCS.

Our study found that the odds of having an intention to screen for CC was 3.4 times higher among participants who took care of patient with cervical cancer. A systematic review done in Uganda revealed having known somebody with CC, or somebody who had undergone CCS, was a motivating factor for women to access screening (151). In a study among nurses in Addis Ababa those who had ever taken care of a patient diagnosed with cervical cancer were 2 times more likely to practice preventive measures including routine screening (85). Another study of nurses in Turkey reported there was a significant relationship between utilizing a Pap test when there was a family history of cancer ($p< 0.05$) (79). Personal experiences and involvement with CC patients or family members may be a mechanism for increasing screening by having women sharing their experiences in public or community venues.

Health care providers that were screened in the past three years had a 13fold greater likelihood for intention to participate in CCS than those who were not screened. Of note, approximately half of the cervical cancers diagnosed in the United States are among women never screened, and an additional 10% of cancers occur among women not screened within the past five years (153). Screening for cervical cancer: a systematic review and meta-analysis that pertain to the effectiveness of screening for reducing cervical cancer mortality and incidence as well as optimal timing and frequency of screening highlights a randomized controlled trial in India showed even a single lifetime screening test significantly decreased the risk of mortality from and incidence of advanced cervical cancer compared to no screening (154). The largest immediate gain in reducing burden of cervical cancer incidence and mortality in Ethiopia may be attained by increasing screening access (regardless of the test used) among women who are currently unscreened or screen less frequently.

In this study predictors such as level of education, marital status, income, work experience and sexual experience did not bring statistical significance towards intention to screen for CC among health care professionals. This might be related to the fact that majority of studies came with this result assessed women in general not health care professionals and it could also be explained by the difference in time and place studies conducted.

Conclusions

The findings from this study suggested that, intention to screen for cervical cancer among female healthcare professionals was low in one of the largest academic health science center in Ethiopia. The observed poor knowledge and low uptake of CCS in our study population of educated female health care professionals is of great concern and may potentially have a negative effect on the attitudes of the general population of women in Ethiopia towards utilization of the screening procedure. Since nurses and medical clinicians make up the largest percentage of health care providers, their integration and participation in cervical cancer screening approaches is vital for behavioural change. The study findings also may fill the gap in the existing knowledge, help policymakers when they make decisions that facilitate intention to screen for cervical cancer, serve as an important tool to develop comprehensive cervical cancer prevention programs to increase utilization of the screening services. Further research is needed on why female healthcare professionals have a negative view of CCS and if these attitudes incorporate other preventive practices in Ethiopia such as breast cancer and other forms of cancer screening. There needs to be a discussion in communities and at the national policy level on how to best meet the needs of the women of Ethiopia by increasing access to cervical screening.

Chapter IV

Article 3: Health Belief Model ability to predict intention to screen for cervical cancer using visual inspection with acetic acid among female healthcare professionals

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Abstract

Introduction: Cervical screening in Ethiopia is less than 1 % and has been noted that among women developing cancer, 50% to 60% have never been screened or adequately screened. An understanding of factors that predict cervical cancer screening behaviours using the Health Belief Model (HBM) may contribute to the development of more effective screening. In Ethiopia studies evaluating the predictability of the HBM towards intention to screen for cervical cancer are very limited. The purpose of this study was to investigate the predictive effects of the HBM constructs on cervical cancer screening intention among female health care professionals (HCPs).

Methods: This cross-sectional study consisted of (n=460) female HCPs, aged 30 years and older recruited from Addis Ababa University, College of Health Sciences. Structured questionnaire data were gathered using the psychometrically tested 24 Item modified version of the Champion's Health Belief Model Scale for cervical cancer screening, along with socio-demographic questions. Correlation, logistic regression and receiver operating characteristic curve (ROC) analysis were conducted.

Results: A Pearson's correlation analysis indicated that there was a positive and negative relation among the components of HBM. Perceived benefit, barrier to fear of negative outcome, barrier to health delivery, perceived seriousness and self-efficacy were significantly associated with intention to screen for cervical cancer. The ability of the HBM model to predict intention to screen for cervical cancer was acceptable (AUC 0.742) for perceived seriousness and poor identifying ability for perceived benefit and self-efficacy (AUC of 0.579 and 0.697) respectively. In addition, the ability of the model to predict no intention to screen for cervical cancer were acceptable for perceived barrier to fear of negative outcomes and perceived barrier to health delivery with AUC of 0.745 and 0.715 respectively.

Conclusion: This study supports the use of constructs of the modified HBM for predicting intention to screen for cervical cancer with VIA among female health professionals in Ethiopia. Some constructs of the HBM may better explain cervical cancer screening intentions and behavior and may contribute to the development of targeted interventions to promote screening uptake in LMICs.

Keywords: Cervical cancer screening, Intentions, Health care professionals. Health belief model, Predictability

Introduction

Each year, more than half a million women are diagnosed with cervical cancer which is responsible for over 300,000 deaths worldwide (128). In Sub-Saharan Africa, cervical cancer is the most common cause of female cancer-related deaths (155). In Ethiopia, cervical cancer is the second most frequently diagnosed cancer and the leading cause of cancer mortality among women aged 15 to 44 years (156). The International Agency for Research on cancer assessments, estimates that the number of new cervical cancer cases in Ethiopia will increase from 7,500 in 2020 to 15,300 in 2040. Similarly, mortality rates will be more than double from 5,340 in 2020 to 11,000 by 2040 (36).

Early detection of cervical cancer, through screening followed by treatment of detected precancerous lesions can prevent the progression to cancer. Some of the strategies suggested by Ethiopia National Cervical Cancer Prevention Program (ENCCP) are population-based cervical cancer screening using visual screening using acetic acid (VIA) for all women aged 30-49 every 5 years. Additionally, for women who screen positive with VIA, cryotherapy is a treatment option (157).

Key to the success of all cancer screening is early screening of asymptomatic, healthy women when the cancer may be more amenable to treatment. Cancer screening is sub-optimal across different cancers and different delivery systems in Ethiopia (40). Among Ethiopian women cervical screening is less than 1 % and has been noted that among women developing cancer, 50% to 60% have never been screened or adequately screened. This emphasizes the importance of finding innovative strategies to provide access to high-quality, low-cost screening to women not engaged in screening programs (158).

The use of established theoretical frameworks has been crucial in the development of effective, evidence-based interventions to change health behaviour (159). The health belief model (HBM) originated in the 1950s and was used to predict a person's attitudes and actions (behaviours) regarding health issues and has been refined over the years (160). This framework has been commonly applied to explain intrapersonal decision-making processes on a wide range of health behaviours, including vaccination and screening (161, 162).

An individual's beliefs about a health problem, perceived benefits, barriers, and self-efficacy determine whether or not that person will engage in health-promoting behaviours (163). Behaviour intention refers to a person's subjective determination and the probability that the individual will perform some behaviour (164). Those who have a positive attitude and belief toward cancer screening (165), perceive the issue as more serious (166), perceive more benefits to screening (167), have a lower barrier to screening (164) and are more likely to have the intention to screen. A specific behaviour can be performed to prevent the disease, the benefits clearly outweigh any barriers. Moreover, the addition of certain dimension to the basic HBM model, such as perceived self-efficacy improves its predictive capacity to explain preventive behaviours such as cervical cancer screening (168).

Based on the ability of the HBM to predict screening behaviours, we were interested in conducting a study that aimed to determine the relationship between perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers, and self-efficacy with the intention to go for VIA cervical cancer screening among female Ethiopian health care professionals. Prior studies have shown the HBM to be useful in predicting who will undertake a variety of health behaviours, such as cervical cancer screening. A literature review of the few published studies revealed strong support for the HBM's perceived benefit and barrier constructs, but relatively weak support for the HBM's perceptions of the disease construct in predicting cervical cancer screening behaviour (29, 169). However, empirical evidence regarding the application of HBM constructs to predict cervical cancer screening remains scant. In follow-up to the initial psychometric study (170), the purpose of this study was to test the predictive validity of the revised scale for identifying women's intention to screen for cervical cancer. Therefore, this study aims to evaluate which constructs of the HBM predicts intention to screen for VIA among female health care professionals in Addis Ababa, Ethiopia.

Methods

Design, sample, setting, and recruitment

This study utilized a cross-sectional design to determine which constructs of the HBM predicts cervical cancer screening intention among female health care professionals. The sampling frame for this study was based on participants' profile obtained from the office of human resource. Samples were proportionally allocated based on the number of female staffs available in the units/ departments. Health care professionals who fulfil the inclusion criteria were approached face to face and also using online platforms of the CHS to fill out questionnaires; those available and willing filled out the self-administered questionnaire. The sample included female health care providers who were (a) working at Addis Ababa University, College of

health science, (b) 30 years of age or older, and (c) not previously diagnosed or receiving treatment for cervical cancer. The rationale for including women 30 years of age or older is because cervical cancer has a long precancerous period, usually taking more than 10 years to progress from precancerous lesions to invasive cancer. As a result, it is rare for cervical cancer to develop in a woman less than 30 years of age (WHO 2006). In addition, the Federal Ministry of Health of Ethiopia supports implementing VIA testing starting age 30 (112).

Instrument

Data was collected using a 32-item, two-part questionnaire comprising socio-demographic information, and a modified psychometrically evaluated version of the Champions Health Belief Model for Cervical Cancer Screening. The socio-demographic form assessed participants' age, marital status, level of education, and unit of work. The modified version of the Champion's Health Belief Model Scale for cervical Cancer Screening using VIA, a 24- item tool, measured female health care professionals' health beliefs by perceived susceptibility (three items), perceived benefits (six items), and perceived barriers to fear of negative outcome (three items), perceived barrier to health delivery (three items), perceived seriousness (six items), and self-efficacy (three items). Responses to the modified Champions HBM Scale for cervical cancer screening were set on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The internal consistency reliability coefficients for the health belief constructs had an acceptable range between 0.76- 0.90 In addition, confirmatory factor analysis was caried and the model fit showed an acceptable fit with all indices within limits and with a significant fit (171). The Trans-theoretical model (TTM) was used to categorize intention and if respondents checked a response among the different stages (contemplation, preparation, action, maintenance) was considered as having intention to screen. If respondents indicated a response among the different stages (pre-contemplation, relapse risk, relapse) were considered as having no intention to obtain cervical cancer screening (19). Permission was obtained from the authors prior to the use of the instruments.

Study population

Sample size was determined using Epi INFO STAT Calc. sample calculation for population survey; by considering the expected frequency of 25%obtained prevalence of cervical cancer screening practice from a study on cervical cancer screening knowledge and barriers among women in Addis Ababa, Ethiopia (116). Assuming population size 977, 3% marginal error (d), 95% confidence interval, hence n= 440. The total sample size by adding 10% non-response rate was n = 484. Data were collected from December 2020 to January 2021.

Data analysis

Data were initially examined for completeness and for any outliers. Perceived susceptibility to cervical cancer, perceived benefits of cervical cancer screening, perceived barriers to cervical cancer screening, perceived seriousness to cervical cancer, perceived susceptibility to cervical cancer and self-efficacy to cervical cancer screening were the independent variables in this study and are the main constructs of the HBM. The dependent variable, intention toward cervical cancer screening, was derived from the stages of change of the trans-theoretical model. Descriptive statistics were calculated to describe the characteristics of the sample, through frequencies and percentages. Bivariate correlation was used to examine the relationship between each construct of HBM. We present adjusted odds ratios (OR) and 95% confidence intervals (95% CI) from logistic regression analyses. The goodness-of-fit of the model was examined using Hosmer-lemeshow test. Multiple regression analysis was conducted to identify which construct had significance with intention with p-value of 0.05. Those statistically significant constructs were further analysed using ROC analysis to evaluate the predictability of HBM constructs for intention determined by area under curve with sensitivity and specificity value. The value of AUC ranges from 0-1: where a value of 0.5= No discrimination, 0.5-0.7 = Poor discrimination, 0.7-0.8 = Acceptable discrimination, 0.8-0.9= Excellent discrimination >0.9 = Outstanding discrimination (111). The level of statistical significance was set at $p < 0.05$.

Results

Socio-demographic characteristics

The sample included 460 female health care professionals at Addis Ababa University College of Health Sciences with a mean age M=33.8, SD=5.3 years. Majority of the participants were nurses 281 (61.1%) and 271 (58.9%) had less than 5years of work experience as shown in Table 10.

Table 10 Socio-demographic characteristics of health care professionals working in the CHS, AAU, Ethiopia (n=460)

Variable	Category	Frequency	Percent %
Age in Years	30 – 34	323	70.2
	35 – 39	88	19.1
	40 – 44	20	4.3
	≥45	29	6.3
Marital status	Never married	230	50.0
	Married	206	44.8
	Widowed and divorced	24	5.2
Service in years	< 5	271	58.9
	5 -10	126	27.4
	>10	63	13.7
Educational level	BSc	291	63.3
	MSc	109	23.7
	MD	49	10.7
	Others*	11	2.4
Monthly income	<6193 ETB	193	42
	6194 – 9056 ETB	171	37.2
	>9056 ETB	96	20.9
Professional stream	Clinical	385	83.7
	Academic	75	16.3
Professional title	Nurse	281	281
	Midwife	39	8.5
	Physician	55	12
	Others**	85	18.5
Unit of work	Oncology	55	12
	Medical-Surgical	356	77.4
	Out patient	28	6.1
	Others***	21	4.6

*: PhD, Diploma**: pharmacist, anaesthetist, laboratory technicians, lecturers***: EPI: Expanded program for immunization, ER: Emergency, GYN: Gynaecology; 1$= 55ETB (Ethiopian birr)

Correlation of HBM constructs

A Pearson's correlation analysis was performed to examine underlining relation between components of the HBM. The findings indicated that there was a significant positive and negative relationship among the components of HBM except for perceived benefit and perceived susceptibility (r= 0.075, p value .107). See Table 11.

Table 11 Correlation matrix of the relationship among the HBM constructs

		BEN	BAR 1	BAR 2	SER	SUS	Self-efficacy
BENEFIT	R	1	-.143**	-.227**	.182**	.075	.279**
	p-value		.002	<.001	<.001	.107	<.001
BARRIER 1	R	-.143**	1	.629**	-.220**	-.160**	-.292**
	P-value	.002		<.001	.<.001	.001	<.001
BARRIER 2	R	-.227**	.629**	1	-.204**	-.176**	-2.78**
	p-value	<.001	<.001		<.001	<.001	<.001
SERIOUSNESS	R	.182**	-.220**	.204**	1	.399**	.259**
	p-value	<.001	<.001	<.001		<.001	<.001
SUSCEPTIBILITY	R	.075	-.160**	-.176**	.399**	1	.284**
	p-value	.107	.001	<.001	<.001		<.001
SELF-EFFICACY	R	.279**	-.292**	-.278**	.259**	.284**	1
	p-value	<.001	<.001	<.001	<.001	<.001	

BEN: Benefit; BAR 1: Barrier to fear of negative outcome; BAR 2: Barrier to health delivery; SER: Perceived seriousness; SUS: perceived susceptibility: **. Correlation is significant at the 0.01 level (2-tailed)

Logistic regression

More than half 257(55.9 %) of the participants had no intention to screen for cervical cancer with VIA and 203(44.1%) had intentions to be screened. In bivariate analysis (considering each factor one at a time relative to intent to screen for cervical cancer), all constructs of the HBM had a p value < 0.2. In the final logistic regression model, we found that five of the constructs, perceived benefit, barrier to fear of negative outcome, barrier to health delivery, perceived seriousness and self-efficacy had a statistically significant association with intention to screen for cervical cancer at p-value <0.05 shown in Table 12.

Table 12 HBM constructs associated with intention of cervical cancer screening with VIA among health care workers working at CHS, AAU, Ethiopia (n=460)

Model term	'Crude' Unadjusted		Full model 'Adjusted'	
	COR [95%CI]	p-value	AOR [95%CI]	p-value
Perceived Benefit	1.03[0.994,1.067]	.101	0.945[0.904,0.987]	.012
Barrier to fear of negative outcome	0.745[0.697,0.798]	<.001	0.804[0.735,.987]	<.001
Barrier to health delivery	0.753[0.697,.0813]	<.001	0.894[0.807,0.990]	.032
Perceived seriousness	1.194[1.145,1.245]	<.001	1.183[1.124,1.246]	<.001
Perceived susceptibility	1.151[1.087,1.218]	<.001	0.995[0.922,1.074]	.896
Perceived Self-efficacy	1.252[1.176,1.334]	<.001	1.178[1.091,1.273]	<.001

ROC analysis

Once significant constructs of the HBM were identified by logistic regression the next step was to measure the predictability of HBM constructs for intention using ROC analysis. Predictability was determined by area under curve with sensitivity and specificity values.

Perceived seriousness construct with 15.5 optimal cut-off point predicted intention to screen for cervical cancer produced a sensitivity 69% and specify 68.5%, AUC 0.742 with acceptable identifying ability of intention to screen for cervical cancer.

Perceived benefit construct with 29.5 optimal cut-off point predicted intention to screen produced a sensitivity 57.1% and specify 59.5%, with AUC 0.579. And perceived self-efficacy construct with 11.5 optimal cut-off point predicted intention to screen produced a sensitivity 71.9% and specify 58.8%, with AUC 0.697. Both constructs of the HBM had poor discriminative ability to identify intention to screen for cervical cancer.

Perceived barrier to fear of negative outcome construct with 8.5 optimal cut-off point predicted no intention to screen for cervical cancer produced a sensitivity 75.1 % and specify 63.1%, with AUC 0.745. Also perceived barrier to health delivery construct with 6.5 optimal cut-off point predicted no intention to screen produced a sensitivity 71.6 % and specify 65%, with AUC 0.715. Both constructs of the HBM have acceptable discriminative ability to identify no intention to screen for cervical cancer as shown in figure 4.

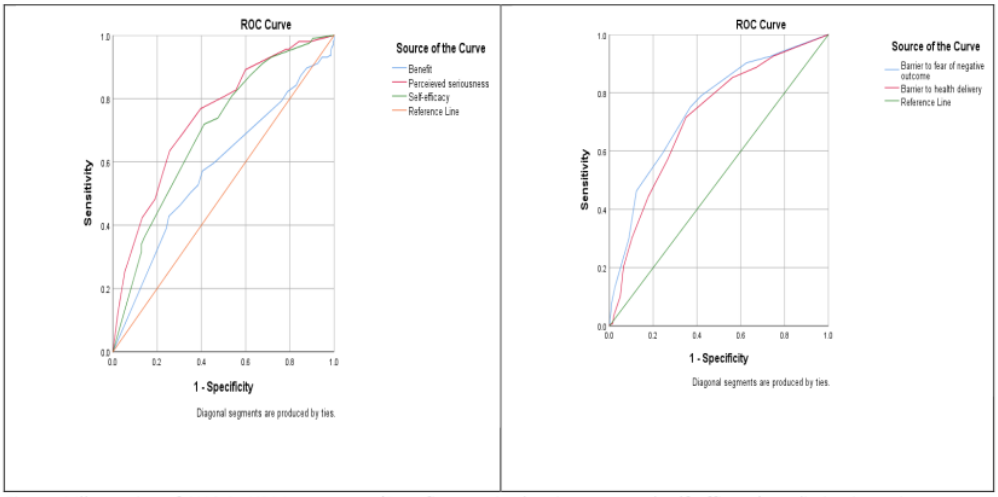

Figure 4 Illustration of AUC 4a HBM constructs (Benefit, perceived seriousness and self-efficacy) predicting intention to screen; 4b. HBM construct (barrier to fear of negative out come and barrier to health delivery) predicting no intention to screen

Discussion

Findings from this study demonstrated that some constructs of the HBM predicts intention to screen for cervical cancer among female healthcare professionals in Ethiopia. Except for susceptibility the other constructs of the HBM were shown to be associated with intention to screen. The key findings of this study provide evidence of the predictive value of the 24-item 6 factor modified Champions HBM for Cervical Cancer Screening using VIA for identifying health care professionals' intention to screen for cervical cancer.

From the HBM constructs, perceived benefits and perceived barriers were significant predictors of screening intention with higher perceived benefits about screening and lower perceived barriers being associated with a higher intention which supports previous studies (168, 172, 173). In addition, in a previous study of Iranian and Turkish women who perceived a greater benefit of performing the Pap test, perceived fewer barriers and higher self-efficacy and were more likely to undergo cervical cancer screening (174, 175). A study among health care workers in India indicated that lack of awareness regarding its HPV vaccine, dosage, schedule, and cost exists even in a highly educated population in the health care sector (176). Thus, women who perceive screening to be beneficial and who perceived fewer barriers to participate in screening are more likely to have positive screening intentions. Also, health care providers who perceive positive benefits of screening for their own benefit may be more likely to promote the same among their female patients.

It is worth noting that the perceived barriers to screening may be health system-related, such as accessibility and cost. Perceived barriers and fear of negative outcomes or time investment (the

time spent in the process of receiving screening test) may also contribute to poorer screening behaviours. Therefore, future work is needed to overcome personal/attitude and health system barriers with the aim of increasing the uptake of cervical cancer screening.

Findings from the current study found that perceived seriousness was a predictor of cervical screening intention. This finding is supported by a study conducted in Ghana that perceived seriousness was a significant predictor of increased cervical cancer screening practices (177). Another study from Canada showed women were more likely to be screened for HPV testing if they had higher rates of perceived behavioural control (178).

Our study reveals that self-efficacy predicts intention to screen which is supported by the literature. Among studies higher self-efficacy and lower perception of barriers were significantly associated with intention to screen among Korean and Chinese women (179, 180). Results supported the theoretical relationship between self-efficacy and health behaviour in that women with higher self-efficacy were more likely to have had screening test than women with lower self-efficacy (181). Self-efficacy has been found to be an important determinant of many health behaviours and our findings indicate that it was important for VIA test screening as well; as the higher the perception of self-efficacy is the higher the compliance with the disease and treatment. Other studies also noted that women who were confident in their abilities to schedule a Pap test, to undergo the Pap test, or to manage any emotional distress caused by the test reported substantially higher screening rates (182, 183). As self-efficacy has high success rates in making a decision for cervical cancer screening (181, 184) we believe increasing self-efficacy may be key target for interventions to improve cervical screening rates.

Perceived susceptibility did not predict intention to screen among our study population and this finding is similar to a study among Brazilian women that perceived susceptibility was not associated with ever/never having been screened (185). In another study, women who perceived themselves to be healthy was the most common reason for rejecting screening test (186). This is in contrast to other studies conducted in southwest Ethiopia and in Kenya, which found perceived susceptibility to be the major contributing factor for increased cervical cancer screening utilization (187). Also, the discrepancy across studies might be the individual variation as perceived susceptibility is a subjective perception of the person contracting a disease. Therefore, educational campaigns should be considered to increase women perceived susceptibility and future research is needed to identify additional factors that may influence intention to screen.

Intention is the most important predictor of actual performance of a behaviour (188). The HBM has been criticized for being inconsistent and to have minimum predictive ability. Studies using the HBM to explain women's preventive health behaviours such as cervical screening support that perceived benefits and perceived barriers were strong predictors. In addition, there is weak support for perceived susceptibility and perceived severity for participating in preventive behaviours (189). Evaluating predictability of the HBM towards intention to screen for cervical cancer have both theoretical and practical applications. This study could also inform future research direction on the theoretical constructs to be integrated as part of a theory-based intervention.

Study strength and limitation

The strengths of our study are that we examined the predictive power of each subscale of the HBM and its applicability to cervical cancer screening. These results also serve to identify intervention priorities that may be useful to apply to improve cervical cancer screening. The generalizability of our results is tempered by the moderate sample size and dependence on a sample drawn from only one hospital. We also acknowledge that our sample does not fully represent the Ethiopian population as a whole since they were educated and resided in urban location.

Conclusion

Findings from this study supports that health behaviour theories such as the HBM used in this study may explain cervical cancer screening intentions and behaviours. Use of behavioural theories could also be useful for theoretical and practical application and contribute to the development of targeted interventions to promote screening uptake. Although we recommend implementation of the 24-item scale for use in clinical practice in Ethiopia, it is important to further evaluate the scale in other populations of women to examine the accuracy of prediction.

Chapter V

Integrative summary

The purpose of this study was to provide a conceptual understanding of the psychometric properties of the modified HBM and predictive ability of the HBM and identify factors for intention to screen for cervical cancer screening.

The specific aims of the study were to:

Aim 1: Validate the psychometric properties of the modified HBM for cervical cancer and VIA among health care professionals working at the College of Health Sciences Addis Ababa University

Aim 2: Determine the preexisting factors affecting the intention of cervical cancer screening among health care professionals working at the College of Health Sciences Addis Ababa University

Aim 3: Determine predictability of HBM constructs with intention of cervical cancer screening among health care professionals working at the College of Health Sciences Addis Ababa University

The study was conducted to assess the cervical cancer screening intention among health care professionals working at the College of Health Sciences of Addis Ababa University. The researchers utilized a psychometrically tested Health Belief Model, guided by the Trans-Theoretical Model, to understand the factors influencing screening intentions. The results indicated that health care professionals had exhibited varying levels of intention to undergo cervical cancer screening, with factors such as perceived susceptibility, severity, benefits, barriers, and self-efficacy playing significant roles in shaping their intentions. The study highlights the importance of addressing these factors in promoting cervical cancer screening among health care professionals to improve early detection and prevention of the disease.

In the context of healthcare professionals, evaluating the psychometric properties of this modified HBM involves examining its reliability, validity, and predictive power. Reliability refers to the consistency of measurement, and it involves assessing the internal consistency of the HBM constructs through measures such as Cronbach's alpha. And the study revealed 0.7-0.9 which determined the stability and consistency of the model in capturing healthcare professionals' beliefs related to cervical cancer screening. Validity is another critical aspect, encompassing content validity, construct validity, and criterion-related validity. Construct

validity that assessed whether the model measures what it intends to measure, which involves confirmatory factor analysis to confirm the structure of the modified HBM; and the study has evaluated with excellent and acceptable model. Although, there was a difference from the original HBM 42 in the number of items and factor structure, CFA was conducted to assess whether the six -factor EFA measurement was appropriate for the study population. CFA revealed that each item had acceptable loading with its factor. All factors had a good inter-factor correlation and measured similar concepts with acceptable model fit indices. Content validity ensures that the model comprehensively covers relevant aspects of cervical cancer screening beliefs. Criterion-related validity examines the extent to which the model correlates with actual screening behaviors or intentions among healthcare professionals.

The revision of the original 42-item instrument presented here resulted in a shorter yet equally comprehensive basis for measuring HBM constructs. Although the initial 42-item instrument had adequate psychometric properties, the conciseness of the revised version translates into a reduced respondent burden, which may help to enhance survey completion rates in clinical settings. In this case, the instrument was reduced by 18-items (42.9 %) with apparently minimal loss of information, if any; however, validation of the reduced instrument in different samples is still necessary and should be the focus of future work.

Also, synthesizing these psychometric properties provides a comprehensive understanding of the modified HBM's effectiveness in capturing healthcare professionals' beliefs and attitudes towards cervical cancer screening. It also offers insights into the model's ability to predict actual screening behaviors, thereby informing the development of targeted interventions to promote VIA screening among healthcare professionals. For instance, under the construct for barrier variables like 'It is difficult to get an appointment for VIA'; so, creating modalities to have short waiting list in the clinicals could be a solution to improve screening practice in the clinical area and enhance early detection to minimize cancer related deaths. As the same time this finding implies for researchers to work on the feasibility of the different screening techniques for cervical cancer like self-testing kits and its efficacy as our finding revealed 'I would be ashamed to lie on a gynecologic examination table and show my private parts to have a VIA' researchers may be interested to look in the feasibility, acceptability of the different screening techniques to optimize screening utilization in the general population the case of Ethiopian women.

Applying the HBM to predict intention to screen for cervical cancer using VIA among female healthcare professionals involves assessing their perceptions of these key constructs. By synthesizing data on perceived barriers related to fear of negative outcomes and health delivery within the HBM, researchers can examine how well these factors predict individuals' intentions to undergo cervical cancer screening. The ROC analysis can provide insights into the model's ability to accurately classify individuals based on their likelihood of screening, thereby informing interventions guide the development of targeted interventions aimed at addressing these barriers and promoting screening uptake among at-risk populations.

Intention is the most important predictor of actual performance of a behaviour (188). The HBM has been criticized for being inconsistent and to have minimum predictive ability. Studies using the HBM to explain women's preventive health behaviours such as cervical screening support that perceived benefits and perceived barriers were strong predictors. In addition, there is weak support for perceived susceptibility and perceived severity for participating in preventive behaviours (189). Evaluating predictability of the HBM towards intention to screen for cervical cancer have both theoretical and practical applications. This study could also inform future research direction on the theoretical constructs to be integrated as part of a theory-based intervention.

The Trans-Theoretical Model (TTM) provides a valuable framework for understanding the intention to screen for cervical cancer and the associated factors among female healthcare professionals. This model consists of several stages of change, including pre-contemplation, contemplation, preparation, action, and maintenance, each of which can be applied to the context of cervical cancer screening intention. More than half 55.9 % of the participants had no intention to screen for cervical cancer and 46.5% of the participants were in the pre-contemplation stage, that is female healthcare professionals might not consider cervical cancer screening due to factors such as poor knowledge which was evident in our study 52% of the health care professionals had poor knowledge about cervical screening and over all knowledge was factor associated with screening. Cervical cancer screening uptake reported in a systematic review and meta-analysis revealed that knowledge about cervical cancer screening was significantly associated with cervical cancer screening (147). The other could be fear of the screening procedure, as screening with VIA makes you to lie on the examination table was stated as a barrier by health care professionals so the belief one holds have impact on the screening practice. Therefore, understanding these barriers and other not listed under is essential for developing interventions to move individuals from pre-contemplation to contemplation and

striving for ongoing support and reinforcement of the importance of regular screening are crucial to ensure sustained behaviour change.

The low knowledge level of cervical cancer and screening found in this study is surprising considering the profession of the respondents, as they are expected to be more knowledgeable than other women in the community. Training among study participants in relation to CC was low and may play an important role in the knowledge gap concerning CCS. Countries wishing to implement new, or strengthen existing, cervical cancer prevention programs must build local capacity to do so. By necessity, these countries generally rely on in-service training of existing providers, which is the most efficient way to quickly generate sufficient numbers of competent providers (152). In-service training is essential to develop a sense of efficiency and effectiveness of one's own capability to engage in health promotive strategies including regular CCS.

In conclusion, the Health Belief Model offers a comprehensive framework for understanding and predicting intention to screen for cervical cancer using VIA among female healthcare professionals. Key finding of this study provides evidence of the predictive value of the 24-item 6 factor modified Champions HBM for Cervical Cancer Screening using VIA for identifying health care professionals' intention to screen for cervical cancer. By considering the interplay of perceptions of threat, benefits, barriers, and self-efficacy within this model, interventions can be tailored to effectively promote VIA screening and improve cervical cancer prevention among this population.

Implications for future practice, research and policy

- The present study findings have several clinical practice, research and policy implications. The findings suggests that health care professionals of any specialty should receive targeted interventions that focus on increasing knowledge and awareness about cervical cancer screening. This can help improve their intention to undergo regular cervical screening and encourage and advocate them to promote screening among their patients or general population to minimize and reduce mortality of cervical cancer.
- Although we recommend implementation of the 24-item scale for use in clinical practice in Ethiopia, it is important to further evaluate the scale in other populations of women to examine the accuracy of prediction.

Future Research

- Directions for future research include testing the instrument in other populations of Ethiopian women.
- Future studies may consider adapting the modified HBM scale for VIA to examine perception towards cervical cancer and possible barriers that influences screening behaviors.
- Future studies comparing the original 42-item and updated 24 items tool with external measures to support external validity of each construct and subscale will be beneficial and provide greater understanding of the psychometric properties of the tool.
- Further research is needed on why female healthcare professionals have a negative view of CCS and if these attitudes incorporate other preventive practices in Ethiopia such as breast cancer and other forms of cancer screening.
- Study could be conducted to testing a similar HBM and TTM in other cancers.
- Comparative studies across different healthcare settings and regions can help identify variations in screening intentions among health care professionals and inform targeted interventions based on specific needs and challenges.
- Do an implementation science study what factors are barriers or facilitators that prevent the uptake of CCS.
- A great follow up study will be to do qualitative study on why HCPs are reluctant to have screens.

Policy/MOH

- Assessing the perceptions of women about screening and perhaps helping to evaluate interventions to increase screening in LMICs, such as Ethiopia.
- Policies should be developed to support the implementation of workplace-based cervical cancer screening programs for health care professionals. This can help create a culture of regular screening within healthcare setting and improve overall screening rates.
- The study findings also may fill the gap in the existing knowledge, help policymakers when they make decisions that facilitate intention to screen for cervical cancer, serve as an important tool to develop comprehensive cervical cancer prevention programs to increase utilization of the screening services.
- There needs to be a discussion in communities and at the national policy level on how to best meet the needs of the women of Ethiopia by increasing access to cervical screening.

- Use of behavioral theories could also be useful for theoretical and practical application and contribute to the development of targeted interventions to promote screening uptake.
- Policy makers should prioritize the integration of cervical screening education and training into the curriculum of health care professional programs in-depth; this can help ensure that future professionals are well equipped to promote screening services and advocate for their own health.

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APPENDICES

Appendix A: Letter requesting the IRB to conduct the main study

To: Institutional Review Board (IRB) College of Health Sciences, AAU

Subject: Request for Approval of PhD Dissertation proposal to Conduct a Disertation Project

I am a PhD Nursing student of this college. For the partial fulfillment of the requirments for Doctor of phliosophy degree, I will be undertaking dissertation project titled: Cervical Cancer Screening Intention Among Health Care Professionals Working At The College of Health Sciences of Addis Ababa University: Applying Psychometrically Tested Health Belief Model Informed by the Trans-Theoretical Model: 2020 Hence; I would request the office for kind approval of the project.

With regards,

Semarya Berhe, RN, BSc.N, MSc.N

Department of Midwifery

CHS, AAU

Appendix B: Certificate of IRB, CHS, AAU Approval of the study

Addis Ababa University College of Health Sciences
Institutional Review Board
Title:
3.4. Initial Review of Application Protocol

SOP# AAUMF 010
Version 3.0
Effective date: 1 June 2015
Page 1 of 10

ANNEX 1
Form AAUMF 01-010
Page 1 of 2

APPLICATION FORM for INITIAL REVIEW

Protocol Title: Cervical cancer screening intention among health care professionals working at the College of Health Sciences of Addis Ababa University using psychometrically tested Health belief model guided by trans-theoretical model, 2020

Protocol number:

Total Participants to be included: 694

STUDY TYPE: (Mark "✓ "whichever apply to the study)

- [x] Survey based ☐ Social ☐ Medical ☐ Community based ☐ Individual
- ☐ Screening ☐ Observational ☐ Epidemiology ☐ Intervention study
- ☐ Clinical Trial: ☐ Phase I ☐ Phase II ☐ Phase III ☐ Phase IV
- ☐ Genetic Study ☐ Retrospective [x] Prospective ☐ Others......

STUDY POPULATION:: ☐ Healthy ☐ Patient ☐ Vulnerable groups ☐ Animals

CHARACTERISTICS of PARTICIPANTS PARTICIPATED:

- Age Range: ☐ 0 -17 yrs ☐ 18 - 44 yrs ☐ 45 - 65 yrs ☐ ≥ 66 yrs
- Pediatric ☐ None ☐ < 1 yr ☐ 1-3 yrs ☐ 4 -14 yrs
- Impaired ☐ None ☐ Physically ☐ Cognitively ☐ Mentally
- ☐ Specify the age range as 30 to 65

REQUESTED EXCLUSION OF PARTICIPANTS:

☐ None [x] Male ☐ Female [x] Children ☐ Other (specify)______________)

SPECIAL RESOURCE REQUIREMENTS (check all that apply):

- ☐ Intensive Care ☐ Isolation unit ☐ Surgery
- ☐ Pediatric Intensive Care ☐ Transfusion ☐ CAT scan
- ☐ Gene therapy ☐ Controlled substances (Narcotics/Psychotropic)
- ☐ Prosthetics ☐ Gynecological services ☐ others, specify...............

IONIZING RADIATION USE (X-rays, radioisotopes, etc):
[x] None ☐ medically indicated only

INVESTIGATIONAL NEW DRUG (IND) / DEVICE (IDE):

[x] None

☐ IND
FDA No.:..................
Name:......................
Sponsor:...................
Holder:.....................

☐ IDE
FDA No:.......................
Name:...........................
Sponsor:.........................
Holder:...........................

PROCEDURE USE:	☐ Invasive	☐ Non-invasive	[x] Not applicable
MULTI-SITE COLLABORATION:	☐ YES	[x] NO	
FINANCIAL DISCLOSURE:	☐ YES	☐ NO	
Conflict of Interest chairperson.	[x] NO	☐ If yes, specify or declare it to the	

INSTITUTE RESEARCH CONTACT
Name:.............................. Address: Fax
E-mail:................................ Telephone ....

Scanned by CamScanner

ANNEX 1
Form AAUMF 01-010
Page 2 of 2

APPLICATION FORM for INITIAL REVIEW

PARTICIPATING INVESTIGATORS:

First / Last Name	License No.	Institution	Telephone / Fax No.	Signature
1. SEMARYA BERHE		AAU, CHS	+251911010243	
2. Rebecca Gary		Emory University	404-712-8993	
3. Katherine Yeager		Emory University	404 727-8627	
4. Mitike Molla		AAU, CHS	+251966221732	
5.				
6.				
7.				
8.				
9.				
10.				

TYPE OF REVIEW:

☑ Initial Review ☐ Resubmission Review ☐ Amendment Review ☐ Expedited Review	☐ Emergency Review ☐ Continuing Review ☐ Report Review ☐ Protocol Termination	☐

SIGNATURES:

_____ Date: .....
Principal Investigators

_____ Date: .....
Protocol Chairperson (if applicable)

COMPLETION:

_____ Date: .....
Secretary, IRB, ...AAUMF...

APPLICATION NUMBER : ☐☐☐/☐☐-☐☐

Appendix - C Psychometrically tested 24 item Tool to screen for cervical cancer screening with VIA applying HBM among Female Health Care workers working at CHS,AAU, Ethiopia

HBM constructs	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 strongly agree
Perceived benefit					
1. Having regular VIA will help to find changes to the cervix, before they turn into cancer					
2. If cervical cancer was found at a regular VIA test its treatment would not be so bad					
3. I think that having a regular VIA is the best way for cervical cancer to be diagnosed early					
4. Maintaining good health is extremely important to me					
5. I feel it is important to carry out activities which will improve my health					
6. Having regular VIA will decrease my chances of dying from cervical cancer					
Perceived Seriousness of cervical cancer					
1. I am afraid to think about cervical cancer					
2. The thought of cervical cancer scares me					
3. When I think about cervical cancer, my heart beats faster					
4. If I had cervical cancer my whole life would change					
5. Problems I would experience with cervical cancer would last a long time					
6. Cervical cancers would threaten a relationship with my boyfriend, husband, or partner					
Perceived susceptibility					
1. I feel I will get cervical cancer sometime during my life					
2. It is likely that I will get cervical cancer in the future					
3. My chances of getting cervical cancer in the next few years are high					
Barrier to Fear of negative outcome					
1. I am afraid to have a because I don't know what will happen					
2. I am afraid to have VIA for fear of a bad result					
3. I would be ashamed to lie on a gynecologic examination table and show my private parts to have a VIA					
Barrier to Health delivery					
1. My partner does not want me to get VIA					
2. It is difficult to get an appointment for VIA					
3. The VIA may move the intrauterine device					
Self-efficacy					
1. I feel capable of getting a VIA test.					
2. I feel capable of managing any emotional distress caused by VIA test					
3. I feel capable of arranging to have a VIA test.					

APENDIX D: SIDA Grant for AAU Women Researchers

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ምክትል ፕሬዚዳንት ጽ/ቤት
የምርምር ዳይሬክተር ቢሮ

Addis Ababa University
Vice President for Research and
Technology Transfer
Office of the Director for Research

Ref. No.: RD/LT- 159/2019
Date: December 25, 2019

To: - Semarya Berhe

From: - Tadesse Fetahi (PhD)
Director for Research

Dear Semarya

The Office of the Director for Research in collaboration with SIDA Grant Coordination called AAU women researchers to submit project proposals for possible funding. You have applied as the PI of a project entitled **"Cervical cancer screening among Addis Ababa University staffs; using Health belief model clued by Trans-theoretical model"**.

The review process is completed and the Senate Standing Committee for Research and Publication has endorsed all applications. I am pleased to inform you that your project is selected for funding.

The project is granted a sum total of Birr 120,000.00 (One hundred twenty thousand birr only), financially supported from SIDA project.

Wishing you success in all your future endeavors.

CC:

- Office of the President, AAU
- Office of vice president for Research and Technology Transfer.AAU
- Project Budget and Finance
- SIDA Projects Coordination Office
- Associate Dean for Research and Technology Transfer, CHS

Tel: 251 111 23 97 71, 251 111 23 9749 e-mail: vpr_dgs@aau.edu.et P.O.Box 1176, Addis Ababa, Ethiopia

Appendix E: Participant information sheet and consent

Dear respondent

Greeting!

My name is _____ I am a member of the research team, as data collector for the study that will be conducted to determine 'Cervical Cancer Screening Intention among health care professionals working at the College of Health Science of Addis Ababa University: Using Psychometrically Tested Health Belief Model informed by the Trans-Theoretical Model: 2020. The study is part of a PhD research requirement conducted by Sr. Semarya Berhe Lemlem, studying her PhD in Addis Ababa University, College of Health Science, School of Nursing and Midwifery, in collaboration with Emory University, Nell Hodgson Woodruff School of Nursing. The study contains self-administered questionnaires to explore the necessary information about the above-mentioned issues. Thus, you are invited to take part in this study by giving genuine responses to all structured questions. Your cooperation and willingness are greatly appreciated and helpful in achieving the aim of the research.

The following information describes the research study in which you are being asked to participate. Please read the information carefully. In the end, you will be asked to sign if you agree to participate.

PURPOSE OF THE STUDY:

You are being asked to participate in a research study. The purpose of this study is to examine the beliefs and intention of the health care professionals working at the College of Health Science have related to Cervical Cancer and screening. You are being asked to be in the study because you are a professional working at the college of health science in Addis Ababa University.

PROCEDURES:

If you agree to participate in the study, the researcher will ask you to answer an item questionnaire about Cervical Cancer and screening, demographic, clinical and personal behavior questionnaire. The questionnaire will take approximately 60 minutes, and you will need to answer only one time.

RISKS:

We do not expect that any harm will happen to you because of joining this study. If you feel tired/exhausted, due to the nature of your job, you can stop temporarily and continue at your convenience.

BENEFITS:

There will be no direct benefit to you from participating in this study. However, the information that you provide may help health care professionals to better understand how Cervical Cancer Screening can be promoted. In case of injury, we do not anticipate that any harm will occur to you as a result of participation in this study. However, if any physical injury resulting from participation in this study should occur, we will provide you with medical treatment according to the current standards of care in Ethiopia.

ALTERNATIVE:

Your alternative is not to participate in the study.

CONFIDENTIALITY:

Your answers will be confidential. Your name will not appear in any document. You will be identified through a number, which will be assigned in the questionnaire that you will receive. The relationship between your name and your answers will not be possible to link, because your name is not required on the questionnaire. The questionnaire and the informed consents will be secured in the researcher's office, in a locked cabinet.

COMPENSATION:

You will not be paid for your participation in this study.

RIGHT TO DECLINE OR WITHDRAW:

Your participation in this study is voluntary. You are free to refuse to participate in the study or withdraw your consent at any time during the study. Your withdrawal or lack of participation will not affect anything. I would also like to inform you that this study will be approved by Addis Ababa University, College of Health Sciences Ethical Review Board (IRB).

Addis Ababa University

College of Health Sciences,

Institutional Review Board

Tel; +251 11 8 96 13 96

Email: chs.irb@.aau.edu.et

If you have question about the study, the address of the principal investigator is:

CONTACT INFORMATION:

Semarya Berhe (+251-911-01-03-47) will gladly answer any questions you may have concerning the purpose, procedures, and outcome of this project.

Advisors

Dr. Mitike Molla (+251-911-13-18-05)

PARTICIPANT AGREEMENT:

I have read the information in this consent form and agree to participate in this study. I have had the chance to ask any questions I have about this study, and they have been answered for me. I am entitled to a copy of this form after it has been read and signed. Based on this information, I voluntarily agree to take part in this study

_____ _____

Signature of Participant Date

Apendix-F: Data Collection Tool

Tool for data collection for dissertation titled: Cervical Cancer Screening Intention among health care professionals working in the College of Health Sciences of Addis Ababa University; using psychometrically tested Health Belief Model informed by the Trans-theoretical model: 2020

Purpose: to test psychometric properties of the modified health belief model and factors associated with intention to screen for cervical cancer and predictably of the HBM towards intention to screen for Cervical cancer.

PART I: SOCIO-DEMOGRAPHIC CHARACTERISTICS

Under this part independent variables such as age, religion, marital status, work experience, profession and income are going to be filled:

Question	Responses
101. Age	_____ in years
102. Marital status	1. Single 2. Married 3. Divorced 4. Widowed 5. Cohabited
103. Service in years	_____ in years
104. Educational level	1. Diploma 2. BSc 3. Masters 4. MD 5. PhD 6. Others, specify_____
105. Monthly income	In birr_____
106. Professional stream	1. Clinical 2. Academic
107. Professional title	1. Nurse 2. Midwife 3. Physician 4. Clinical laboratory 5. Pharmacist 6. Anesthetist 7. Other; Specify _____
108. Unit of work	1. Medical Ward 2. Surgical ward 3. Oncology 4. Outpatient 5. Other, specify _____

PART II Preexisting Factors (Clinical, Life style)

Under this part independent variables such as age at first sex, number of sexual partners, use of tobacco, drink, contraceptive use, history of STD is going to be filled.

QUESTIONS	RESPONSES
201. Height	_____ Meter
202. Weight	_____ kg
203. Age at first sexual contact	_____
204. What is your sexual experience status?	1.Currently involved in sexual relationship 2. Not currently involved in sexual relationship 3. Never had sexual experience
205. Have you ever had multiple sexual partners?	1. Yes 2. No
206. What is the number of sexual partners that you have had within the past year?	1. 0 2. 1 3. 2 or more
207. Do you use condoms?	1. Yes 2. No
208. If Yes:	1.Always 2.Usually 3. Sometimes 4. Occasionally 5. Rarely
209. Do you drink alcohol?	1. Yes 2. No
210. If your response to Qn. No. 209 is Yes how often do you drink alcohol?	1. Always 2. Usually 3. Sometimes 4. Occasionally 5. Rarely
211. Do you use substance? (Like chat chewing)	6. Yes 7. No
212. If your response to Qn. No 211 is Yes how often do you use substance? (Like chat chewing)	1.Always 2.Usually 8. Sometimes 9. Occasionally 10. Rarely
213. Have you smoked cigarettes in your entire life?	1. Yes 2. No
214. Have you smoked at least 100 cigarettes (5 pack)	1. Yes 2. No
215. If your response to Qn. No 214, is Yes how often have you smoked at least 100 cigarettes (5 pack)	1. Yes, every day 2. Yes, some days

216. Do you now smoke cigarettes?	1. every day 2. some days, 3. not at all
217. Have you ever used oral contraceptives?	1. Yes 2. No
218. If you are currently using oral contraceptives, for how long?	_____ in year
219. Have you ever had any history of sexually transmitted infections	1. Yes 2. No
220. If Yes to Q No 219 please choose among	1. HPV 2. HIV 3. Others specify _____
221. Have you ever had gave birth? If your response is **'No'** please Skip to question number 225	1. Yes 2. No
222. Age at first pregnancy?	_____ in years
223. How many times/ parity	_____
224. Have you experienced instrumental delivery?	1. Yes 2. No

PART III Knowledge of cervical cancer and screening among health care professionals working at College of Health Science in Addis Ababa University

Item	Response
301. Definition of cervical cancer	
302. Source of information	1. Regular course 2. Work colleagues 3. Books/ magazines 4. Radio/televisions 5. Training 6. others, specify _____
303. Diagnosed for cervical cancer If No Skip to Qn. No. 306	1. Yes 2. No
304. Get any treatment	1. Yes 2. No

305. Type of treatment received	1. Surgery 2. Radiation therapy 3. Chemotherapy
306. Do you know anyone diagnosed with cervical cancer	1. Yes 2. No
307. Relation with your family	1. First degree relatives (mother, sister, daughter) 2. Family member 2. Relative 3. Friend 4. Others, _____
308. Have you ever take care of a patient with cervical cancer?	1. Yes 2. No
309. Signs and symptoms (circle for possible answer)	1. No symptoms in early-stage 2. Post-coital bleeding 3. Post-menopausal bleeding 4. Dyspareunia 5. Increased vaginal discharge
310. Risk factors (circle for possible answer)	1. Multiple sexual partners 2. Multiple pregnancies 3. Early marriage 4. Tobacco smoking 5. Low socioeconomic status 6. Long-term OCP use 7. HPV infection
311. Prevention of cervical cancer	1. No multiple sexual partners 2. Avoiding multiple pregnancies 3. Use of condom instead of long-term OCP 4. Avoiding early marriage/early sexual debut 5. HPV immunization 6. Maintaining good personal hygiene 7. Regular cervical screening 8. Proper treatment of sexually transmitted infections

312. Cervical cancer is treatable if detected early	1. Yes 2. No
313. Available screening tests	1. Pap smear test 2. VIA (Visual inspection with acetic acid) 3. HPV (Human papilloma virus) test
314. Ideal time to start cervical cancer screening	1. Any women at child bearing age 2. Women aged ≤ 21 years of age 3. At age of 21 or three years after sexual debut 4. At age of 25-35 years 5. Above 35 years 6. Don't know
315. Screening interval	1. Every year 2. PAP test: every three year at ages 21-29 years 3. Co-testing (HPV and Pap): Every five year at age of 30-65 years 4. Pap alone: Every three year at age of 30-65 years 5. HPV alone: Every five year at age of 30-65 6. Every 10 years 7. Don't know
316. When to stop cervical cancer screening	1. Aged >65 years with adequate screening history 2. Women who have had a total hysterectomy

PART IV: ADAPTED CHAMPION'S HEALTH BELIEF MODEL SCALE FOR CERVICAL CANCER AND SCREENING AND TURKISH HEALTH BELIEF MODEL SCALE FOR CERVICAL CANCER AND SCREENING

The Health Belief Model Scale for Cervical Cancer and Screening has 42 items in 5 subscales: Benefits of Pap Smear Test and Health Motivation, Barriers to Pap Smear Test, Perceived Seriousness of Cervical Cancer, Susceptibility to Cervical Cancer, and Health Motivation. All the items of subscales have 5-point Likert-type response choices: "strongly disagree (scores 1 point) disagree (scores 2 point), neutral (scores 3 point), agree (scores 4 point) strongly agree (scores 5 points). Higher scores indicate stronger feelings regarding that construct. All scales are positively related to screening behavior except for barriers, which have a negative association.

Benefits of VIA and Health Motivation	1Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 strongly agree
1. Having regular VIA will help to find changes to the cervix, before they turn into cancer					
2. If cervical cancer was found at a regular VIA test its treatment would not be so bad					
3. I think that having a regular VIA is the best way for cervical cancer to be diagnosed early					
4. Having regular VIA will decrease my chances of dying from cervical cancer					
5. I want to discover health problems early					
6. Maintaining good health is extremely important to me					
7. I look for new information to improve my health					
8. I feel it is important to carry out activities which will improve my health					
Barriers to VIA	1Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 strongly agree
1. I am afraid to have VIA for fear of a bad result					
2. I am afraid to have a because I don't know what will happen					
3. I don't know where to go for a VIA					
4. I would be ashamed to lie on a gynecologic examination table and show my private parts to have a VIA					
5. Having a VIA takes too much time					
6. Having a VIA is too painful					
7. Health professionals doing VIA are rude to women					
8. I neglect or cannot remember to have a VIA regularly					

9. I have other problems more important than having VIA in my life					
10. I am too old to have a VIA regularly					
11. There is no health center close to my house to have a VIA					
12. If there is cervical cancer development in my destiny, having a VIA cannot prevent it					
13. I prefer a female doctor to conduct a VIA					
14. I will never have a VIA if I have to pay for it					
15. I do not have time to get VIA					
16. The VIA may move the intrauterine device					
17. My partner does not want me to get VIA					
18. It is difficult to get an appointment for VIA					
Perceived Seriousness of Cervical Cancer	1Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 strongly agree
1. The thought of cervical cancer scares me					
2. When I think about cervical cancer, my heart beats faster					
3. I am afraid to think about cervical cancer					
4. Problems I would experience with cervical cancer would last a long time					
5. Cervical cancer would threaten a relationship with my boyfriend, husband, or partner					
6. If I had cervical cancer my whole life would change					
7. If I developed cervical cancer, I would not live longer than 5 years					

Susceptibility to Cervical Cancer	1Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 strongly agree
1. It is likely that I will get cervical cancer in the future					
2. My chances of getting cervical cancer in the next few years are high					
3. I feel I will get cervical cancer some time during my life					
Health Motivation	1Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 strongly agree
1. I eat well balanced meals for my health					
2. I exercise at least 3 times a week for my health					
3. I have regular health check-ups even when I am not sick					
Self-efficacy	1Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 strongly agree
1. I feel capable of arranging to have a VIA test.					
2. I feel capable of getting a VIA test.					
3. I feel capable of managing any emotional distress caused by VIA test					

Part IV: Trans-theoretical-model to identify stage of change to address the intention of cervical cancer screening

Question	Response
401. Have you ever been screened for cervical cancer screening in your life time?	1. Yes 2. No
402. Have you been screened for cervical cancer in the past three years?	1. Yes 2. No
403. What is your plan of action towards cervical cancer screening (circle one that suits best for you)	1. never had a VIA and no intention to have one within the next 6 months 2. never had a VIA but intends to have one within the next 6 months 3. never had a VIA but intends to have one within the month 4. had one VIA in the past year and intends to continue getting regular VIA 5. had regular VIA and intends to continue to do so 6. on schedule, but no intention to get one in the future 7. had VIA in the past, none in the last 3 years, and does not intend to get one

THANK YOU!!

Appendix-G Curriculum vitae of PI

Curriculum Vitae

1. Personal information	
First name(s) / Surname	**Semarya Berhe Lemlem**
Address	Addis Ababa University
Mobile	+251911 01 03 47
E-mail	semitaye@yahoo.com besemarya@gmail.com semarya.berhe@aau.edu.et
Skype	Semita19
Nationality	Ethiopian
Date of birth	September 29,1986
Gender	Female
2. Employment / Occupation	
	September 2009– 2014 At Mekelle University Since October 2014- At Addis Ababa University
Occupation or position held	Assistant Professor
Main activities and responsibilities	Academic, research, and community service
Type of business or sector	Higher Governmental Teaching & Learning Institution
3. Formal**Education and training**	
	Addis Ababa University (AAU) -Sept. 2005- June 2008

Name of Institution	Addis Ababa University (AAU) - Sept. 2009 - June 2011 Addis Ababa University (AAU) - October. 2016 - July 2016 Lund University- Malmo Sweden- SIDA sponsored- January 2017-March 2018
Title of qualification awarded	BSc. In Nursing MSc In Maternity & Reproductive Health Nursing Higher Diploma in Learning-Teaching in Higher Education Advanced International Training Program in Sexual and Reproductive Health and Rights
Principal subjects/occupational skills covered	**Undergraduate courses covered**:- Human Anatomy, Human Physiology , Medical Surgical , Fundamental Nursing , Paediatrics, Obstetric and Genecology, Epidemiology ,Biostatics, Human Nutrition, Health Education, Communicable Disease Control, Health service management, Environmental Health , Pharmacology, Organic Chemistry , Biochemistry , Nursing Administration , Community Based Team training programme , Curriculum and Nursing Education , Pathology , Sociology ,Psychology. **Post graduate courses**: -Theoretical foundation of Nursing, Nursing Ethics, Curriculum and Nursing Education, Advanced Pathophysiology, Advanced Pharmacology, Advanced Health Assessment, Research Methodology, Maternity nursing, Biostatics

4. Work experience

Time line	**Job description**
Since October 2024 to present	**Post Graduate coordinator**
March 2017 to present	Assistant Professor
June 2011 – 2017	Lecturer
June 2011- 2012	Unit Head
September 2008-september 2009	Graduate assistance-1(GA-I)

5. Personal skills and competences

Mother tongue(s)	**Amharic**
Other language(s)	**English**

Position now	Assistant Professor
Publication	1.Assessment of Knowledge of Breast Cancer and Screening Methods among Nurses in University Hospitals in Addis Ababa, Ethiopia, 2011 2.Prevalence and Determinants of Substance Abuse Among Street Children in Mekelle City, Tigray, Ethiopia 3.Integration of HIV Services with Post Abortion Care and Associated Factors in Eastern Zone Tigray, 2013 4. Application of Nursing Process and its affecting factors among nurses working in Mekelle Zone Hospitals, Northern Ethiopia. 5.Assessment of Long Acting and Permanent Contraceptives Method Utilization and Factors Associated Among Married Women of Reproductive Age Group In Adigrat Town, Tigray Region, Ethiopia 6.Knowledge, Preventive Practice and Associated Factors of Female Nurses' Towards Cervical Cancer in the Selected Government Hospitals in Addis Ababa, Ethiopia 7. Factors Affecting the Practices of Cervical Cancer Screening among Female Nurses at Public Health Institutions in Mekelle Town, Northern Ethiopia, 2014: A Cross-Sectional Study 8. Risk factors of pregnancy related hypertension among women attending maternal health care service in selected public hospitals of Tigray, Ethiopia 9. Utilization of Youth Friendly services and associated factors in Mekelle Town, Tigray, Northern Ethiopia 10. Knowledge and practice on prevention of obstetric fistula among skilled birth attendants in public health centres in Addis Ababa, Ethiopia 11. Incidence of Surgical Site Infection and Factors Associated among Caesarean Deliveries in Selected Government Hospitals in Addis Ababa, Ethiopia, 2019 12. Nursing students challenges towards clinical learning environment at the school of nursing and Midwifery in Addis Ababa University. A qualitative study 13. Immediate postpartum intrauterine contraceptive device utilization and influencing factors in Addis Ababa public hospitals: a cross-sectional study 14. Prevalence of Fatigue and Associated Factors Among Cancer Patients Attending Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

15. Knowledge, Practice and Associated Factors Towards Medication Abortion Among Reproductive-Age Women in Sexual and Reproductive Health Clinics of Addis Ababa, Ethiopia, 2018: Cross-Sectional Study

16. Knowledge and Attitude Towards Human Papillomavirus Vaccine and Associated Factors Among Mothers Who Have Eligible Daughters in Debre Markos Town, Northwest Ethiopia

17. Discontinuation rate of long-acting reversible contraceptives and associated factors among reproductive-age women in Butajira town, Central Ethiopia

18. Mekuria Kassa. Gereegziher Buruh. Semarya Berhe. Alemeseed Aregay. Haftu Berhe. 2014. Prevalence and Determinants of Substance Abuse Among Street Children in Mekelle City, Tigray, Ethiopia. J.Bio. Innov. 3(6):269-282

19. Lemlem SB, Gary RA, Yeager KA, Sisay MM, Higgins MK. Psychometric properties of a modified health belief model for cervical cancer and visual inspection with acetic acid among healthcare professionals in Ethiopia. PLoS One. 2024 Apr 11;19(4)

20. Semarya Berhe, Rebecca A Gary, Katherine A Yeager, Melinda K Higgins, & Mitike Molla. (2023). Intention to screen for cervical cancer and factors associated among female healthcare professionals using the trans-theoretical model: Addis Ababa, Ethiopia. The Ethiopian Journal of Health Development, 37(1)

21. Getahun SB, Berhe S, Mekonnen B, Melaku G. Reasons for Not Seeking Healthcare Among Students with Dysmenorrhea: A Qualitative Study. Int J Womens Health. 2023 Nov 11;15:1733-1744. doi: 10.2147/IJWH.S437233. PMID: 38020940; PMCID: PMC10649844.

Skills

- Basic computer skill
- Basic Software Skill (SPSS, Epi Info)
- Driving License (Automobile)

Some trainings	Certificate of training on • Effective Teaching Skill by AIDSTAR One • International English Language Testing System (IELTS) certificate • Infection Prevention and Patient Safety (IPPS) by AIDSTAR One • Women health development by University of Alexandria in collaboration with Addis Ababa University • Neonatal Resuscitations by VSO • Train the trainer workshop by MSR the Israel Center for medical simulation, Israel • Capacity building for nurses of Africa, by KOICA in South Korea • IMNCI, by Ethiopian Midwives Association, FMoH and Jhpiego • Feto Maternal US imaging by EUS, WFUMB and School of Medicine, CHS, AAU • International course on Market Access for Food Security Towards pro-poor and inclusive market development, in Wageningen, The Netherlands • Leadership course, Medical Education Partnership Initiative Junior Faculty (MEPI-JF) Project AAU, CHS and Emory University
Grants	• The office of the director for research in collaboration with SIDA grant coordination -AAU women researchers,2019 • Small scale research grant from the Recurrent Budget of 2005 E.C

REFERENCE

1. **Rebcca Ann Gary,** RN, PhD, FAHA, FAAN, Professor, Nell Hodgson Woodruff School of Nursing, Emory University,1520 Clifton Road NE, Atlanta, GA 30322,
   Email: ragary@emory.edu
2. **Daniel Mengistu (PhD, Associate Professor),** Department of Nursing and Midwifery College of Health Science, Addis Ababa University
   E-mail: mengistudaniel@yahoo.com
3. **Haftu Berhe (PhD, Professor**), Department of Nursing, College of Health Science, Mekelle University
   E-mail- haftuber@yahoo.com

Declaration

I declare that the above given Information is true to the best of my knowledge.

Appendix- H Curriculum vitae of advisory team

REBECCA ANN GARY, RN, PhD, FAHA, FAAN

Associate Professor, Tenured

Nell Hodgson Woodruff School of Nursing

Emory University

Telephone: (404) 712-8993

Email: ragary@emory.edu

EDUCATION

05/2006	Post-doctoral	Emory University	Nursing
05/2003	PhD	University of North Carolina Chapel Hill	Nursing
08/1979	MSN	University of Alabama at Birmingham	Nursing
06/1977	BSN	Medical College of Georgia	Nursing

LICENSES & CERTIFICATIONS

1975-Present	Registered Nurse, Georgia	80149-2

HONORS & AWARDS

2012	Fellow American Academy of Nursing	American Academy of Nursing
2009	Fellow American Heart Association	Council on Cardiovascular and Stroke Nursing
2008	Young Investigator Award	American Heart Association
2005 Finalist	Heart Failure Society Nursing Research Award	Heart Failure Society of America
2003	Arteriosclerosis/Heart Failure Research Prize	Council on Cardiovascular and Stroke Nursing
2003	Graduate Student Research Benefiting North Carolina	UNC Graduate School.

ACADEMIC EXPERIENCE

07/2011-Present	Associate Professor (tenured)	Nell Hodgson Woodruff School of Nursing, Emory University
08/2005 – 07-2011	Assistant Professor	Nell Hodgson Woodruff School of Nursing, Emory University

08/2004 – 08/2005	Postdoctoral Fellow	Nell Hodgson Woodruff School of Nursing, Emory University
08/2003 – 05/2004	Assistant Professor	Medical College of Georgia
07/1999 – 05/2000	Research Assistant	University of North Carolina
09/1996 – 05/1997	Teaching Assistant	University of North Carolina

PROFESSIONAL POSITIONS

03/1997 – 12/2001	Staff Nurse (PT)	Chapel Hill, North Carolina Interim Health
06/1997 – 08/1999	Staff Nurse (PT)	University of North Carolina Hospital
06/1992 – 07/1996	Coordinator Distance Learning	King Faisal Hospital & Research Center

05/1987 – 05/1991	Education Coordinator	King Faisal Hospital & Research Center
11/1984 – 01/1987	Instructor	King Khaled Eye Specialist Hospital
01/1981 – 10/1984	Staff Nurse (PT) SICU	Shands Teaching Hospital & Clinics
08/1980 – 06/1984	Assistant Professor	University of Florida
09/1979 – 08/1980	Clinical Coordinator Med/Surg ICU	South Georgia Medical Center
08/1978 – 08/1979	Staff Nurse ICU	Birmingham Veterans Hospital
08/1977 – 08/1978	Staff Nurse ICU	Lake City Veterans Hospital
10/1976 – 08/1977	Staff Nurse ICU	Talmadge Memorial Hospital
08/1975 - 08/1976	Staff Nurse ICU	South Georgia Medical Center

SCHOLARSHIP: GRANTS & OTHER FUNDING <u>Current Research Funding</u>

<u>Research Grants Funded by the National Institutes of Health (NIH)</u>

Healing Hearts and Mending Minds in Older Persons Living with HIV (Fitbrain) (D Waldrop-Valverde,**RA Gary)**
R01NR014973
NINR
05/01/2015- 02/29/2020
Co-PI, 20% effort
$2,867,392

Research Grants Completed

Healing Hearts and Mending Minds in Older Persons Living with HIV: Pilot study **(RA Gary)** R0300044615
Center for Aids Research
09/01/15-12/31/17
PI, in-kind
$38,352

Healing Hearts and Mending Minds in Older Persons Living with HIV: Pilot study **(RA Gary)** R0300044615
Center for Aids Research Supplement Grant **(RA Gary)**
10/01/2015-9/30/2016
PI, in-kind
$10,000

The Center for Cognition and Affect in Chronic Illness (D Waldrop-Valverde)
P30NR014134
NINR
09/27/2012-06/30/2017
Co-I, 20% effort
$2,200,000

The Center for Cognition and Affect in Chronic Illness – Supplement (D Waldrop-Valverde)
P30 NR 14134-S1
NINR

09/30/15 – 06/30/16
Co-I, 20% effort
$97,000

Caregiver Stress: Interventions to Promote Health and Wellbeing (S Bauer-Wu, E Corwin, AH Miller) 1P01NR011587-01

NINR
09/30/09-07/31/14
Co-Investigator, 12% effort
$3,400,000

Cost Effectiveness of Quality of Life in Heart Failure Patients with Diabetes. (S Dunbar)
R01NR011888
NINR
09/01/09-08/31/12
Co-I, 5% effort
$900,000

Improving Outcomes in Heart Failure Patients with Diabetes (S Dunbar)
R21NR011204
NINR and ARRA 9/01/09 -8/31/2011
Co-I, 5%

$275,000
Family Partnership Intervention for Heart Failure (S Dunbar)
R01 NRO8800
NINR
6/01/04-5/31/09; No cost extension 11/30/09
Co-I, 5% effort
$2,770,028

Research Grants in Preparation

Evaluation of Mechanisms and Effects of Exercise on Fatigue in Patients with Head and Neck Cancer (C Xiao,**RA Gary)**
To be Re-Submitted in October, 2019
National Cancer Institute Co-PI, 20% Effort
Total Costs: $2,498,359

Improving Outcomes in Older Persons with Heart Failure and HIV **(R Gary)**
Submission in October 2019
National Institute of Nursing Research

Completed Research Grants Funded by other agencies

Fatigue in Head and Neck Cancer: Role of Pro- and Anti-Inflammatory Signaling (C Xiao, **RA Gary**) University Research Center Emory University Pilot Award
05/1/2017- 04/30/2019
Co-PI, in-kind
$30,000
A progressive, home-based aerobic and resistance exercise program for heart failure patients (**RA Gary)** Emory Heat and Vascular Center
12/17/2008-12/16/2009
PI
$50,000

Testing the Psychometric Properties of two fatigue instruments in Heart failure patients. Center for Symptoms Symptom Interactions and Health Outcomes **(RA Gary)**

07/01/2006-05/31/2008
PI, in-kind
$20,000

Testing the feasibility of tele-monitoring for monitoring exercise adherence, symptom severity and HF self-care practices (**RA Gary**)
Cardicom, Inc.
06/01/2006-05/31/2007
PI, in-kind
$5,000

Exercise and cognitive behavioral therapy as an intervention for depression in heart failure patients (**RA Gary)**
AHA Beginning Grant in Aid 0465203D
PI, 5% effort
2/2004-1/2006
$110,000

Current Educational, Training, or Program Grants Funded Fogarty Global Health
Postdoctoral Fellowship (F Aga) NIH
Role: Faculty Advisor
$30,000
07/01/2019-6/30/2020

Interventions to Improve Outcomes in Chronic Conditions (S Dunbar, M Song)
T32NR012715-06
NINR
Assistant Program Director
07/01/2018-6/30/2023
REBECCA ANN GARY, RN, PhD, FAHA, FAAN
08/01/2019
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Completed Educational, Training, or Program Grants Funded Interventions to Improve Outcomes in Chronic Conditions (S Dunbar) T32NR012715
NINR
Assistant Program Director
07/01/2012 – 06/30/2017

Effects of Exercise on Epigenetic Pathways in Persons with Heart Failure (B Butts)
F31 NR015180 NINR
Faculty advisor
$64,680
Funding Period: 02/14 – 05/16 2015

A comparison of bioimpedance and anthropometric measurements in rural frail older women (**RA Gary,** M Dougherty)
Predoctoral Traineeship (T-32), University of North Carolina at Chapel Hill. $30,000.00
NINR
$30,000
07/01/1998- 06/30/1999

Kellett Scholarship for Aging (**RA Gary)**

University of North Carolina at Chapel Hill
Pre-doctoral award
$3000
2001-2002

Kellett Scholarship for Aging (**RA Gary**)
University of North Carolina at Chapel Hill
Pre-doctoral award
$4000
1999-2000

Kellett Scholarship for Aging (**RA Gary**)
University of North Carolina at Chapel Hill
Pre-doctoral award
$800
1998-1999

Glaxo-Wellcom Scholarship (**RA Gary**)
University of North Carolina at Chapel Hill
Pre-doctoral award
$2500

SCHOLARSHIP: PUBLICATIONS (*data-based, +senior or corresponding author, student or mentee underlined)

Peer-Reviewed Publications – Published

1. *+Aga FB, Dunbar SB, Kebede T, Higgins MK, **Gary RA**. Correlates of Self-Care Behaviors in Adults with Type 2 Diabetes and Co morbid Heart Failure. *Diabetes Educ*. 2019:145721719855752, PMID: 31195903

2. *+**Gary RA**, Paul S, Corwin E, Butts B, Miller AH, Hepburn K, Williams, Waldrop-Valverde D. Exercise and Cognitive Training as a Strategy to Improve Neurocognitive Outcomes in Heart Failure: a pilot study. *Am J Geriatric Psychiatry;* Feb 2019, PMID: 30910420

3. *+Aga F, Dunbar SB, Kebede T, **Gary RA**. The role of concordant and discordant co morbidities on performance of self-care behaviors in adults with type 2 diabetes: a systematic review. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*; 2019:12 333–356.

4. *+Butts B, Butler J, Dunbar SB, Corwin E, **Gary RA**. Effects of Exercise on ASC Methylation and IL-1 Cytokines in Heart Failure. *Med Sci Sports Exerc*. 2018;50(9):1757-1766. PMID:29683921

5. * **Gary RA**, Dunbar SB, Higgins MK, Corwin E, Hepburn K, Miller AH. An intervention to improve physical function and care giving perceptions in family caregivers of persons with heart failure. *Journalof Applied Gerontology*, 2018 1:733464817746757. PMID:29347863

6. Owen MI, Braun LT, Hamilton RJ, Grady KL, **Gary RA**, Quest TE. Weblogs: A Complex Data Source for Qualitative Research. *J Card Fail*. 2017;23(11):826-827. PMID:28842379

7. *+ Butts B, Butler J, Dunbar SB, Corwin E, **Gary RA**. ASC Methylation and Interleukin- 1β Are Associated with Aerobic Capacity in Heart Failure. *Med Sci Sports Exerc*. 2017; 49(6):1072-1078 PMID:280726324

8. *+ Butts B, **Gary RA**, Dunbar SB, Butler J. Methylation of Apoptosis-Associated Speck- Like With a Caspase Recruitment Domain and Outcomes in Heart Failure. *J Card Fail*. *2016* 22(5):340-6. PMID:26700661

9. +Butts B, **Gary R**. 20 Things You Didn't Know About Exercise. *J Cardiovasc Nurs*. 2016 31(5):387-9. PMID:27513677

10. * Dunbar SB, Clark, PC, Reilly CM, **Gary RA**, Higgins MK, Stamp K. Family Partnership and Education Interventions to Reduce Dietary Sodium by Patients with Heart Failure Differ by Family Functioning, *Heart Lung*. 2016; 45(4):311-18. PMID: 27174641

11. *+ Butts B, **Gary RA**, Dunbar SB & Butler J. The importance of NLRP3 inflammasome in heart failure. *J Card Fail. 2015;* 21(7):586-93. PMID: 25982825.

12. * Dunbar SB, Reilly CM, **Gary RA,** Higgins MK, Butts B, Culler S, Butler J. Randomized Clinical Trial of an Integrated Self-care Intervention for Persons with Heart Failure and Diabetes: Quality of Life and Physical Functioning Outcomes. *J Card Fail*. 2015; 21(9):719-29. PMID:26028261

13. * Reilly CM, Dunbar SB, **Gary RA**, Culler S, et al. An Economic Evaluation of a Self- Care Intervention in Persons with Heart Failure and Diabetes. *J Card Fail*. 2015; 21(9):730-7. PMID:26164214

14. *Butts B, **Gary R**, Dunbar SB, Higgins MK, Miller A, Corwin E. Caregiver Stress and Cardiovascular Disease Risk Among Female Family Caregivers of Persons with Heart Failure. *JCardiovasc Nurs*. 2014;29(5):390-391.

15. +Butts B and **Gary R**. Coexisting frailty, cognitive impairment, and heart failure: implications for clinical careJournal of clinical outcomes management: *JCOM*. 2015; 22(1):38-46.

16. *Stamp KD, Dunbar SB, Clark PC, Reilly CM, **Gary RA**, Higgins M, Ryan RM. Family partner intervention influences self-care confidence and treatment self-regulation in patients with heart failure. *Eur J Cardiovasc Nurs*. 2014; 13(6):541-8.

17. * Stamp KD, Dunbar SB, Clark PC, Reilly CM, **Gary RA**, Higgins M & Kaslow N. Family Context Influences Psychological Outcomes of Depressive Symptoms and Emotional Quality of Life in Patients with Heart Failure. *J Cardiovasc Nurs*. 2014; 29(6):517-27. PMID:24434821

18. Zeng B, Sun W, **Gary RA**, Li C, Liu T. Towards a conceptual model of diabetes self-management among Chinese immigrants in the United States. *Int J Environ Res Public Health*. 2014;11(7):6727-42. PMID:24978878

19. +**Gary RA**,Brunn K. Aerobic exercise as an adjunct therapy for improving cognitive function in heart failure. *CardiolRes Pract*. 2014;157508. PMID:25105053.

20. * Dunbar SB, Clark PC, Reilly CM, **Gary RA,** Smith A, McCarty F, Higgins M, Grossniklaus, D, Kaslow N, Frediani J, Dashiff C.& Ryan R. (2013). A trial of family partnership and education interventions in heart failure. *J Card Fail*. 2013; 19(12): 829-4. PMID: 24331203.

21. Strath SJ, Kaminsky LA, Ainsworth BE, Ekelund U, Freedson PS, **Gary RA**, Richardson CR, Smith DT, Swartz AM, & American Heart Association Physical Activity Committee of the Council on Nutrition, Physical Activity and Metabolism and the Council on Clinical Cardiology (2013). A Guide to the Assessment of Physical Activity: Clinical and Research Application, A Scientific Statement from the American Heart Association. *Circulation*, 128(20), 2259-79. PMID: 24126387.

22. * Dunbar SB, Butts B, Reilly CM, **Gary RA**, Higgins MK, Ferranti EP, Culler S, & Butler J. A pilot test of an integrated self-care intervention for persons with heart failure and concomitant diabetes. *NursOutlook*, 2014; 62(2):97-111 PMID:24211112.
23. **Gary RA.** Aerobic exercise reduces depressive symptoms in patients with chronic heart failure. *Evidence-based Mental Health*, 2013; 16(2), 42. PMID: 23329053.
24. * Frediani JK, Reilly CM, Higgins MK, Clark PC, **Gary RA**& Dunbar SB. Quality and adequacy of dietary intake in a southern urban heart failure population. *J Cardiovasc Nurs*. 2013; 28(2), 119-128. PMID: 22343212.
25. **Gary R**. Evaluation of frailty in older adults with cardiovascular disease: incorporating physical performance measures. *J Cardiovasc Nurs*, 2012; 27(2), 120-131. PMID: 22334147.
26. * **Gary RA,** Cress ME, Higgins MK, Smith AL & Dunbar SB. A Combined Aerobic and Resistance Exercise Program Improves Physical Functional Performance in Patients with Heart Failure: a pilot study. *J Cardiovasc Nurs*. 2012; 27(5), 418-430. PMID: 21912268.
27. * Grossniklaus DA, Dunbar SB, **Gary R**, Tohill BC, Frediani JK, & Higgins MK. Dietary energy density: a mediator of depressive symptoms and abdominal obesity or independent predictor of abdominal obesity? *Euro J Cardiovasc Nurs*, 2011;11(4):423-31. PMID: 21530408.
28. * Kaplan BG, Abraham C &**Gary R**. Effects of participation vs. observation of a simulation experience on testing outcomes: implications for logistical planning for a school of nursing. *International J NursEduc Scholarship*. 2012; 29(9), PMID: 22850068.
29. * **Gary RA**, Cress ME, Higgins MK, Smith AL & Dunbar SB. A combined aerobic and resistance exercise program improves physical functional performance in patients with heart failure: a pilot study. *JCardiovasc Nurs*. 2012; 27(5), 418-430. PMID: 21912268.
30. *** Gary RA**, Cress ME, Smith AL, Higgins MK & Dunbar SB. Combined Aerobic and Resistance Exercise Program Improves Task Performance in patients with heart failure. Archives of Physical Medicine and Rehabilitation. 2011; 92(9): 1371-1378. PMID: 21878207.
31. * **Gary RA**, Dunbar SB, Higgins MK, Musselman DL & Smith AL. Combined Exercise and Cognitive Behavioral Therapy Improves Outcomes in Patients with Heart Failure. *J Psychosom Res*. 2010; 69(2): 119-131. PMID: 20624510.
32. * Grossniklaus DA, Dunbar SB, **Gary RA**, Tohill B & Higgins MK. Psychological Factors are Important Correlates of Dietary Pattern in Overweight Adults. *J Cardiovasc Nurs*. 2010; 25(6), 450-460. *PMID: 20938248.
33. Grossniklaus DA, **Gary R,** Higgins MK, Frediani J, Dunbar SB. Depressive Symptoms and Dietary Energy Density Independently Predict Abdominal Obesity. *JCardiovasc Nurs*. 2010;25(5):362-363.
34. * Grossniklaus DA, **Gary RA**, Higgins MK & Dunbar SB. Biological and Psychological Differences between Overweight Adults with and without Waist Circumference Risk. *Res Nurs Health*. 2010; 33(6), 539-55. PMID: 21053387.
35. * Reilly CM, Higgins M, Smith A, **Gary RA,** Robinson J, Clark PC, McCarty F, & Dunbar SB. Development, Psychometric Testing, and Revision of the Atlanta Heart Failure Knowledge Test. *JCardiovasc Nurs*. 2009; 24(6): 500-509. PMID: 19858959.
36. **Gary RA**& Davis LD. Diastolic heart failure. *Heart Lung*. 2008; 37(6), 405-416. PMID: 18992623.

37. * Dunbar SB, Clark PC, Quinn C, **Gary RA**& Kaslow N. Family Influences on heart failure self-care and outcomes. *J Cardiovasc Nurs*. 2008; 23(3), 258-265. PMID: 18437068.

38. *** Gary R**& Lee SY (2007). Physical Function and Quality of Life in Older Women with Diastolic Heart Failure: Effects of a Progressive Walking Program on Sleep Patterns. *Prog Cardiovasc Nurs*. 2007;22(2), 72-80. PMID: 17541316.
39. *** Gary R**. Exercise self-efficacy in older women with diastolic heart failure. *J Geron Nurs*. 2006; 32(7),31-39. PMID: 16863044.
40. *** Gary R**. Self-care practices in women with diastolic heart failure. *Heart Lung*. 2006;*35(1), 9-19*.PMID: 16426931.
41. *** Gary R,** Sueta C, Dougherty M, Rosenberg B, Cheek D, Preisser J, Neelon V & McMurray R.Home-based exercise improves functional performance and quality of life in women with diastolic heart failure. *Heart Lung* 2004;33(4): 210-218. PMID: 15252410.
42. *** Gary R**, Sueta CA, Rosenberg B & Cheek D. Use of the six-minute walk test for women diastolic heart failure. *J Cardiopulmonary Rehab*. 2004;24(4): 264-268. PMID: 15286534.
43. **Gary R**& Fleury J. Promoting physical activity in older women: Introduction. *Top Geriat Rehab*.2002;(18):pp vi. Invited Editorial.
44. **Gary R**& Rosenberg B. Considerations for implementing a low-intensity, home-based walking program in older women with diastolic heart failure. *Top Geriatr Rehab*. 2002;18: 34-51.
45. **Gary R**. Promoting functional status through interdisciplinary collaboration. *Top Geriat Rehab*.2002;17: Part II, pp. vi. Invited Editorial
46. **Gary R**& Fleury J. Nutritional Assessment: Key to successful rehabilitation in the elderly.*Top GeriatrRehab*. *2002;* (17), 40-71.
47. **Gary R**, Marrone S & Boyles C. The use of gaming strategies in a transcultural setting.*J Contin EdNurs.1998;* 29(5), 221-227. PMID: 9923232.
48. **Gary R**. Nurse Development Program.*Nurs Admin Q*. 1992;(16): 25-29.
49. * Treloar D, Nalli B, Guinn P &**Gary R**. The effect of familiar and unfamiliar voice treatments on intracranial pressure in head-injured patients. *J Neurosurg Nurs*. *1991;*23(5): 295-299.
50. **Gary R**, Jermier-Jax B & Hickey A. Stroke: The road back to recovery.*RN*Part 2—ContinuingEducation Credit. 1986;(49):49-54.
51. **Gary R**, Jermier-Jax B & Hickey A. Stroke: How to contain the damage (Continuing Education Credit.*RN*. 1986; 49(5): 36-42. PMID: 3635223
52. **Gary R**. Care of patients with cerebral aneurysms.*J Assoc Periop Reg Nurs*. 1983; 37(4): 631-642.
53. **Gary R**. Cerebral vasospasm: Issues, trends and interventions.*J Neurosurg Nurs*. 1981;(13): 256- 264.

Peer-Reviewed Publications – Submitted/Under review

1. * Xaio C, Beitler JJ, Higgins KA, Zhu Y, Zhao H, Bruner DW, Miller AH, **Gary RA**. Pilot Study of Combined Aerobic Resistance Exercise on Fatigue for Patients with Head and Neck Cancer: Inflammatory and Epigenetic Changes. *Cancer*, Submission, July 2019
2. ***+ Gary RA**, Paul S, Corwin E, Butts B, Miller AH, Hepburn K, Williams, Waldrop-Valverde D. Exercise and Cognitive Training Intervention improves Self-Care Management

and Functional Capacity in Persons with Heart Failure. *International Journal of Geriatric Psychiatry*, Submission, June 2019

REBECCA ANN GARY, RN, PhD, FAHA, FAAN
08/01/2019
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3. *+ Aga F, Dunbar SB, Kebede T, Higgins MK, **Gary RA**. Correlates of Self-Care Behaviors in Adults with Type 2 Diabetes and Comorbid Heart Failure. Submitted, *Diabetes Spectrum,* June 2019.
4. *+ Aga F, Dunbar SB, Kebede T, Higgins MK, **Gary RA**. "Sociodemographic and Clinical Correlates of Diabetes Self-Efficacy in Adults with Type 2 Diabetes and Comorbid Heart Failure" *Nursing inResearch and Health*, April 2019, *Under Revision*

Other Publications (please label as book chapter, book review, research abstract, software, video, etc.)

1. Book chapter: Parker, KP, Dunbar, SB, **Gary RA**. *Sleep* (Chapter 8). In Cardiac Nursing (6th ed). Woods SL, Froelicher E, Motzer S, Bridges E (eds). Lippincott Williams and Wilkins, 2010, p 177-203. ISBN:978-0-7817-9280-6

Book chapter: **Gary R** (2004). Physical activity recommendations and the cardiovascular patient. *CVNursing Secrets*. L. Davis (ed), 425-434.

SCHOLARSHIP: PUBLISHED ABSTRACTS AND PROCEEDINGS (*data-based; +corresponding orsenior author; authors underlined are students or mentees)

1. *+Butts B, Butler J, Dunbar SB, Corwin EJ, **Gary RA**. Interleukin-1 beta and Methylation of ApoptosisAssociated Speck-Like Protein Containing a Caspase Recruitment Domain are Associated with AerobicCapacity in Heart Failure, *Circulation,* 2016;134:7.
2. *+Butts B, Dunbar SB, Butler J, **Gary RA**. Effects of an Exercise Intervention on ASC Methylation andIL-1 Cytokines in Persons with Heart Failure. *Journalof Cardiac Failure*, 2016;22:S13.
3.* Dunbar SB, Corwin EJ, Gary RA, Higgins MK, Smith A, Butler J. Novel Correlates of Depressive Symptoms in Family Caregivers of Heart Failure Patients. *Circulation*, 2016; 134:A12706
4. * Dunbar S, Reilly CM, Gary RA, Higgins MK, Butler J. Characteristics of responders to an integratedself-care intervention for persons with heart failure and diabetes. *EuropeanHeart Journal*, 2015;36: 37.

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5. * Butts B, Gary RA, Dunbar SB, Butler J. ASC Methylation and Expression are Associated withDepressive Symptoms, Anxiety, and Quality of Life in Heart Failure. Journal of Cardiac Failure, 2015;21:S6.
6. * Reilly CM, Higgins M, Butler J, Gary R, Culler SD, Dunbar SB. Cost Effectiveness of an Integrated SelfCare Intervention for Persons with Heart Failure and Diabetes. *Journalof Cardiac Failure*, 2015; 20: S5.
7. * Dunbar SB, Reilly CM,Gary RA, Higgins MK, Culler S, Butler J. An Integrated Self Care Education andCounseling Intervention for Persons with Heart Failure and Diabetes Improves Quality of Life and PhysicalFunctioning. *Journalof Cardiac Failure*, 2014; Volume 20, Issue 8, Supplement, Page S118.
8. * Butts B,**Gary R**, Reilly CM, Higgins MK, Butler J, Dunbar S. Effects of an Integrated Self-Care Intervention on Frailty Risk in Persons with Heart Failure and Type 2 Diabetes Mellitus. *Circulation*, 2014;130:3

9. * Routledge FS**, Gary RA**, Rogers AE, Paul S, Dunbar SB. Association of Sleep Medication with Cardiorespiratory Fitness in Normotensives, Prehypertensives and Hypertensives. *Circulation*, 2014; (130):issue suppl_28.
10.* Dunbar, **Gary R**, Corwin E, M, Higgins MK, Butler J. Effects of a heart failure family caregiverintervention on caregiver strain and outcomes. *Circulation,* 2014;130(Suppl_2).
11.* Dunbar SB, Clark PC, Reilly CM**, Gary RA**, Smith AL, McCarty F, Higgins MK, Grossniklaus DA, and others. A Trial of Family Partnership and Education Interventions in Heart Failure. *Journalof CardiacFailure*, 2013; Vol. 19, Issue 12, p829–84.
12.* Cress E, Higgins MK, **Gary R**. Clinically important effects of exercise on functional performance inpatients with heart failure. *Gerontologist*, 2012; 52:586.
13**.* Gary R,**Higgins M, Cress E, Smith A, Dunbar S. Improved Physical Function Confers Greater Qualityof Life Benefits for NYHA Class III Than for NYHA Class II Patients. *Journalof Cardiac Failure*, 2012, 18: s74.
14.* Dunbar SB, Clark PC, Smith AL, Reilly CM, **Gary R,**McCarty F, Robinson J, Kaslow N. FamilyPartnership and Education Interventions Reduce Dietary Sodium Intake by Patients with Heart Failure*Circulation*, 2009;120:S499.
15**.* Gary RA,**Cress E, Smith AL, Higgins M, Dunbar SB. Combined Aerobic and Resistance TrainingImproves Physical Functional Performance and Muscle Strength in Patients with Heart Failure. *Circulation*, 2009; 120: S511-S512
16.* Dunbar SB, Clark PC, **Gary RA**, Mccarty F, Higgins M, Reilly CM, Grossniklaus D, Robinson JM,Smith AL. Family member interventions improve their knowledge of heart failure and supportive
communication. *EuropeanHeart Journal*, 2009;30:3.
17**.* Gary RA,** Sueta CA, Dougherty MC, Rosenberg BS, Cheek DJ, Preisser JS, Neelon VJ, McMurray RG. Low to moderate intensity home-based exercise improves exercise tolerance and quality of life in women with diastolic heart failure, 2009; *Journal of Cardiac Failure*, Vol. 9, Issue 5, S59.

18.* Dunbar SB, Clark PC, **Gary RA,** Quinn C, Reilly CM, Smith AL, Higgins MK. HF Family CaregiverOutcomes and Associated Factors, Journal *of Cardiac Failure*, 2009: Vol. 15, Issue 6, S108–S109.
19.* Dunbar SB, **Gary R**, Clark PC, Mccarty F, Smith A, Kaslow N, Reilly C, Quinn C. Family functioning,self-management behaviors, and outcomes in patients with heart failure. *EuropeanHeart Journal*, 2008;29:760
20**.* Gary RA,**Dunbar SB, Musselman DL, Cress EM, Higgins MK. Use of the symptom interactionalframework to examine the multidimensional domains of fatigue and depression in heart failure patients.*Journal of Cardiac Failure,* 2008;14: S91.
21.* Dunbar SB, Clark PC, **Gary RA**, Reilly CM, Quinn C, Smith A, Butler J. Comparison of self-carebehaviors and outcomes in HF patients with and without diabetes. *Journalof Cardiac Failure*, 2008: 14: S99-S100.
22.* Reilly CM, Clark PC, **Gary RA,** McCarty F, Smith AL, Quinn C, Dunbar SB. Health outcomes andassociations with dietary sodium intake in heart failure patients. *Circulation*, 2008;117: E444.
23**.* Gary R,**Dunbar S, Elaine C, Cotsonsis G. Exercise and cognitive behavioral therapy reducesdepression severity, increases physical function and enhances quality of life in New York heart associationclass II and III patients. Circulation, 2008:117: E436.

24. * **Gary RA**, Dunbar SB, Clark PC, Cotsonis GA. Gender Is Not Associated with Depressive Symptoms in Heart Failure. *Journal of Cardiac Failure*, 2007; Volume 13, Issue 6, Supplement 2, Page S166
25. *Cress ME, Hayes DM, Moore TL, **Gary RA**. Physical Functional Performance in Patients with Class II and III Chronic Heart Failure. *Medicine and Science in Sports and Exercise,* 39(5), S287. American College of Sports Medicine. May;2007
26. * **Gary RA,**Robinson JM, Clark PC, McCarty F, Smith AL, Dunbar SB. Biobehavioral factors and heart failure medication adherence. *Circulation*, 2007;116: 486.
27. * **Gary RA**, Cress EM, Hayes DM, Moore TL. Performance of the Domains of Physical Activities of Daily Living among New York Heart Association Class II and III Heart Failure Patients. *Journal of CardiacFailure*, 2007; Volume 13, Issue 6, Supplement 2, Page S174.
28. * **Gary RA,**Lee SYS. Sleep patterns, quality of life and physical function in older women with diastolicheart failure: Effects of a progressive walking program. *Journalof Cardiac Failure*, 2005;11:S93.
29. * Schumacher AM,**Gary RA**, Dunbar SB. Heart rate variability and sudden death risk in women with heart failure. *Journalof Cardiac Failure*, 2005;11: S201.
30. * **Gary RA,**Dougherty MC, Rosenberg B, Cheek DJ, Preisser JS, Neelon VJ, McMurray RG, Sueta CA. Low to moderate intensity home-based exercise improves exercise tolerance and quality of life in womenwith diastolic heart failure. *Circulation*, 2003;108:503.

31. * **Gary R,**Dougherty M, Sueta C, Rosenberg B, Cheek D, Preisser J, Neelon V, McMurray R. The six-minute walk test as an outcome measure for exercise intervention effectiveness in older women with diastolic heart failure. Gerontologist, 2003; 43:496.

SCHOLARSHIP: PRESENTATIONS (# invited presentations denoted, ^podium presentation)

International Presentations (*data-based; +corresponding or senior author; authors underlined are students or mentees; # invited presentations denoted, ^podium presentation)

1. ***^Gary RA**, Dunbar SB, Higgins MK, Hepburn K, Miller A, Corwin E and Bauer-W S. Physical and psychosocial characteristics of family givers of persons with heart failure Sigma Theta Tau International's 24th International Nursing Research Congress, Prague, Czech Republic. July; 2013
2. *^Dunbar, SB, Clark PC, **Gary RA**, Higgins M, McCarty F, Reilly, C, Robinson, J, Smith Al., Family focused Interventions improve HF Family members knowledge and supportive communication, European Society of Cardiology, August 2009, Barcelona, Spain, August; 2009.
3. *^Dunbar, SB, Clark PC, **Gary RA**, Higgins M, McCarty F, Reilly, C, Robinson, J, Smith Al., Family focused Interventions improve HF Family members knowledge and supportive communication, oral abstract presentation, European Society of Cardiology, Barcelona, Spain. August; 2009
4. # Murray J, **Gary, R.A**., Dunbar, S. Research Workshop, Addis Ababa University, School of Nursing Faculty, Addis Ababa Ethiopia. Funded by the Institute of Developing Nations, Emory University. December; 2009

5. *^Dunbar SB, **Gary RA**, Clark PC, McCarty F, Smith A, Reilly CM, Quinn, C. Family functioning, self- management, and outcomes in patients with heart failure, presented at the European Society of Cardiology. Munich, Germany, European Heart Journal, vol29. September 2008.

6. ***^Gary RA**, Dougherty M, Rosenberg B, Cheek DA, Preisser J, Neelon V, McMurray R, Sueta CA. The effectiveness of home-based exercise in women with diastolic heart failure. Sigma Theta Tau, 37th Biennial Convention. Toronto, Canada. November; 2003.

7. ***^Gary RA,** Dougherty M, Rosenberg B, Cheek DA, Preisser J, Neelon V, McMurray R. & Sueta CA. The effectiveness of home-based exercise in diastolic heart failure women. Sigma Theta Tau, Fourteenth International Research Congress on Evidenced Based Practice. St. Thomas Virgin Islands. July; 2003.

National Presentations(*data-based; +corresponding or senior author; authors underlined are students ormentees; # invited presentations; ^podium presentation)

1. **#^Gary RA.**Frailty: What do physical function measures tell us? American Heart Association ScientificSessions, November 2019.

2. ***^Gary RA,**Waldrop-Valverde D, Butts B, Corwin E, Paul S. Exercise and Cognitive Re-Training as aStrategy to improve neurocognitive outcomes in Heart Failure. American Heart Association Scientific Sessions, November 2017.
3. *^Higgins MK, Reilly CM, **Gary RA**, Dunbar SB, Butts B and Butler J. Characterizing Quality of Life Responses and Physical Functioning Improvements to an Integrated Self-care Intervention for Persons with Co-morbid Heart Failure and Diabetes. *Circulation: Cardiovascular Quality and Outcomes*. 2017;10:A224, American Heart Association, March 2017.
4. *+^Butts B, Butler J, Dunbar SB, Corwin EJ, **Gary RA**. Interleukin1β and Methylation of Apoptosis Associated Speck-Like Protein Containing a Caspase Recruitment Domain Are Associated with Aerobic Capacity in Heart Failure. American Heart Association Scientific Sessions, New Orleans, LA. November; 2016
5. ***Gary RA**, Waldrop-Valverde D, Paul S, Corwin EJ, Hepburn K, Williams B. Exercise and Cognitivetraining to Improve neurocognitive outcomes in persons with heart failure. NINR Advancing Science, Bethesda, MD. May; 2017.
6. *+^Butts B, Dunbar SB, Butler J, **Gary RA**. Effects of an exercise intervention on ASC methylation and IL-1 cytokines in persons with heart failure. Rapid Fire Abstract Presentation, Heart Failure Society of America, Orlando, FL. September; 2016.
7. ***+^Gary RA,** Dunbar SB,Butts B, Higgins MK, Hepburn K, Corwin EJ, Miller AH. Improvingphysical function and reducing cardiovascular disease risk among family caregivers of persons with heart failure. Council Academy of Nursing Science (CANS), Washington DC, September; 2016.
8. **#^Gary RA**, Waldrop-Valverde D and Paul S. Exercise to improve cognitive outcomes in cardiovascular disease. American Heart Association Scientific Sessions, November; 2016.
9. *^Dunbar SB, Corwin E. **Gary RA**, Higgins MK, Smith A, Butler J. Novel Correlates of Depressive Symptoms in Family Caregivers of Heart Failure Patients. American Heart Association Scientific Sessions. November; 2016
10. ***+Gary RA**,Butts B, Waldrop-Valverde D, McElroy R, Relli-Moniz P, Kim JH, Brunn K. Exercise andCognitive Retraining in Persons with Heart Failure (EXCITE-HF): Preliminary Findings. Poster presented at the 2015 NINR Center Directors Meeting, Bethesda, MD, May 5, 2015.
11. ***+^Gary RA**, Dunbar SB, Butts B, Higgins MK, Hepburn K, Corwin E and Miller A. ImprovingPhysical Function and Reducing Cardiovascular Disease Risk Among Family

Caregivers of Persons with Heart Failure. American Heart Association Scientific Sessions, November; 2015.

12. ***+Gary, RA**, Dunbar SB, Butts B, Higgins MK, Corwin E, Hepburn K, and Miller AH. Improvingphysical function and reducing cardiovascular disease risk among family caregivers of persons with heart failure. Advancing Science, Improving Lives, NINR's 30th Anniversary Scientific Symposium and Poster Session, NIH, Bethesda, MD. October; 2015

13. *+^Butts B,**Gary RA**, Dunbar SB, Butler J. ASC methylation and outcomes in heart failure. E-Abstract Oral Presentation, American Heart Association Scientific Sessions, Orlando, FL. November; 2015

14. *+^Butts B, **Gary RA**, Dunbar SB, Butler, J. ASC Methylation and Expression are Associated with Depressive Symptoms, Anxiety, and Quality of Life in Heart Failure. Oral Presentation, Heart Failure Society of America, National Harbor, MD. September; 2015.

15. *^Dunbar SB, **Gary RA**, Corwin EJ, Miller AH, Hepburn K, Higgins MK, Butler J. Effects of a Heart Failure Family Caregiver Intervention on Caregiver Strain and Outcomes, American Heart Association, Chicago, IL. November; 2014.

16. *^Dunbar SB, **Gary, RA**, Clark, PC, McCarty, F, Smith, A, Reilly, C, Quinn, C Family functioning, self-management, and outcomes in patients with heart failure. Council for the Advancement of Nursing Science (CANS) Washington DC, October; 2008

17. *^Dunbar SB, Reilly CM, **Gary RA** Higgins MK, Culler S, Butler J. An Integrated Self Care Education and Counseling Intervention for Persons with Heart Failure and Diabetes Improves Quality of Life and Physical Functioning, Heart Failure Society of America, Las Vegas, NV. September; 2014.

*^Butts B, **Gary RA**, Reilly CM, Higgins MK, Butler J, Dunbar SB. Effects of an integrated self-care intervention on frailty risk in persons with heart failure and type 2 diabetes mellitus. American Heart Association Scientific Sessions, Chicago, IL. November; 2014.

18. *Butts B, **Gary RA**, Dunbar SB, Higgins MK, Miller AH, Corwin E. Caregiver stress and cardiovascular disease risk among female family caregivers of persons with heart failure. Poster presentation, Preventive Cardiovascular Nurses Association, Atlanta, GA. April; 2014

19. *^Routledge FS, **Gary RA**, Rogers AE, Paul S, Dunbar SB. Association of Sleep Medication with Cardiorespiratory Fitness in Normotensives, Pre-hypertensives and Hypertensives. American Heart Association, November 2014.

20. ***+^Gary RA**, Higgins MK, Cress ME, Smith AL, Dunbar, SB. Improved physical function confers greater quality of life benefits for NYHA class III then NYHA Class II patients. Heart Failure Society of America. Seattle, WA. September; 2012

21. *^Cress ME, **Gary RA**& Higgins M K Clinically important effects of exercise on functional performance in patients with heart failure. Gerontological Society of America. San Diego, CA. November; 2012

22. *^Grossniklaus DA, Tohill BC, Frediani J, Higgins MK, **Gary RA**, Dunbar SB. Depressive symptoms are important correlates of dietary energy density in overweight adults. Preventive Cardiovascular Nurses Association 15th Annual Symposium, Dallas, TX. April; 2009

23. *^Grossniklaus DA, Frediani J, Higgins MK, **Gary RA**, Dunbar SB. Depressive symptoms and dietary patterns associated with cardio metabolic risk in overweight adults. American Heart Association Quality of Care and Outcomes Research in Cardiovascular Disease and Stroke, Washington D.C. March; 2009.

24. *^Dunbar, SB, Clark PC, **Gary RA**, Quinn C, Reilly CM, Smith A, Higgins M. Heart Failure Family Caregiver Outcomes and Associated Factors, *Journal of Cardiac Failure*, 15 (6, S1), S108.Heart Failure Society of America, Boston, September; 2009

25. ***+^Gary RA**, Cress ME, Smith AL, Higgins MK, Dunbar SB. Combined aerobic and resistance training improves functional performance and muscle strength in patients with HF. American Heart Association Scientific Sessions. Orlando FL. November; 2009
26. *^Dunbar SB, Clark PC, **Gary RA**, Smith AL, Reilly CM, McCarty F, Robison, J. Family Partnership and Education Interventions Reduce Dietary Sodium Intake by Patients with Heart Failure, American Heart Association Scientific Sessions, November; 2009
28. ***+^Gary** RA, Dunbar SB, Musselman DL, Cress ME, Higgins, MK. The multidimensional domain of fatigue in patients with heart failure and depression. Council for the Advancement of Nursing Science. Washington, DC. October; 2008
29. *+^**Gary RA**, Musselman DL, Dunbar SB, Cress ME, Cotsonis GA. Exercise and cognitive behavioral therapy improves depression and clinical outcomes in heart failure patients. Council for the Advancement of Nursing Science (CANS). Washington, DC. October; 2008
30. +^**Gary RA**, Dunbar SB, Musselman DL, Cress ME, Higgins, MK. Use of the Symptom Interactional Framework to examine multidimensional domains of fatigue and depression in heart failure patients. Heart Failure Society of America. Toronto, ON. September; 2008

31. *Dunbar SB, Clark PC, **Gary RA**, Reilly CM, Quinn, C, Smith A, Butler J. A Comparison of Self-Care Behaviors and Outcomes in HF Patients with and without Diabetes, poster presented at Heart Failure Society of America, Toronto, September; 2008
32. ***+^Gary RA,** Musselman DL, Dunbar SB, Cress ME, Cotsonis, G.A. Combined exercise and cognitive behavioral therapy improves outcomes in heart failure patients. American Heart Association: Quality of Care and Outcomes Conference. Baltimore, MD. April; 2008
33. ***+^Gary RA,** Robinson, JM, Clark PC, Smith AL, Dunbar SB Bio-behavioral predictors of medication adherence in heart failure patients, American Heart Association, Orlando Florida, November; 2007
34. ***+^Gary RA**, Dunbar SB, Clark PC, Cotsonis GA. Gender is not associated with Depression in heart failure. Poster presentation: *Journal Cardiac Failure*, 319, S166. September; 2007
35. *+^**Gary RA**, Cress ME, Hayes DM, Moore TL. Performance of physical activities of daily living among New York heart Association Class II and III heart failure patients. Heart Failure Society of America. Washington, DC. September; 2007
36. *^Cress ME, Hayes DM, Moore TL, **Gary RA**. Physical Functional Performance in Patients with Class II and III Chronic Heart Failure. *Medicine and Science in Sports and Exercise,* 39(5), S287. American College of Sports Medicine. May;2007
37. #^Bittner V, Dekerlegand JL, **Gary RA**. How to set up a home-based exercise program for heart failure patients. Heart Failure Society of America. Seattle, WA. September 2006.
38. ***+^Gary RA.**& Lee SY. Sleep patterns, quality of life and physical function in older women with diastolic heart failure: effects of a progressive walking program. Heart Failure Society of America. Boca Raton, Florida. September; 2005.

39. ***+^Gary RA**, Dougherty M, Rosenberg B, Cheek DA, Preisser J, Neelon V, McMurray R, Sueta CA (2005). Low to moderate intensity exercise improves exercise tolerance and quality of life in women with diastolic heart failure. *Circulation,* 108, 503, American Heart Association. November; 2005
40. ***+^Gary RA**, Dougherty M, Sueta, CA. The Six-Minute Walk Test As An Outcome Measure for Exercise Intervention Effectiveness In Older Women With Diastolic Heart Failure. Gerontological Society of America. San Diego. November; 2003
41. ***+^Gary RA**, Dougherty M, Rosenberg B, Cheek DA, Preisser J, Neelon, V, McMurray R, Sueta, C.A. Home-based exercise improves functional performance and quality of life in women with diastolic heart failure. Heart Failure Society of America. Las Vegas, Nevada. September; 2003

State/Regional Presentations (*data-based; +corresponding or senior author; authors underlined arestudents or mentees; # invited presentations; ^podium presentation)

1. *+^ Irwin C, Murden RJ, Waldrop-Valverde D &**Gary RA**. Predictors of exercise adherence in older persons living with HIV (OPLWH). Podium presentation: Southern Nursing Research Society, March 2019.
2. *+ Irwin C, Murden RJ, Waldrop-Valverde D. **Gary RA**. Walk for life: Predictors of exercise adherence in older persons living with HIV (OPLWH). Poster Presentation at Southern Nursing Research Society; March 2019; Orlando, FL.
3. *+ Irwin C, Murden RJ, Waldrop-Valverde D. **Gary RA**. Walk for life: Predictors of exercise adherence in older persons living with HIV (OPLWH). Poster presentation at Scholars Day, Nell Hodgson Woodruff School of Nursing, Emory University, Atlanta GA; April 2019
4. **^Gary RA.** Developing a career trajectory, managing time and work life balance in the pre-doc and post-doc phases. T-32 roundtable. November 2018.
5. *^ **Gary RA**, Waldrop-Valverde D, Paul S, Corwin EJ, Hepburn K, Williams B. Exercise and Cognitive training to Improve neurocognitive outcomes in persons with heart failure. Blue Bag Seminar, Nell Hodgson Wood ruff School of Nursing, Emory University, Atlanta GA. Spring 2017
2. ***+^Gary** RA, Waldrop-Valverde D, Corwin E., Butts B, Paul S. Exercise and Cognitive Re-training as a Strategy to Improve Cognitive Outcomes in Heart Failure: Preliminary Data. Blue Bag Seminar. Nell Hodgson Woodruff School of Nursing, Emory University, Atlanta GA., February; 2016.
3. *+Butts B , **Gary RA**. Factors Associated with Performance on A Symptom Limited Exercise Treadmill Test in Persons with Heart Failure. Poster Discussion Presentation, Southern Nursing Research Society, Dallas, TX. February; 2017
4. *Butts B, Reilly CM, **Gary RA** Higgins MK, Dunbar SB. Factors affecting heart failure knowledge and retention after an integrated self-care intervention in persons with heart failure and diabetes. Poster Presentation, Southern Nursing Research Society Annual Conference, Williamsburg, VA. February; 2016.

5. *^Dunbar SB, **Gary RA**, Corwin E, Miller A, Hepburn K, Higgins MK Butler J, Bauer-Wu S. Family Caregiver Intervention Improves Psychological Symptoms in Family

Caregivers of Persons with Heart Failure, Southern Nurses Research Society, Tampa Fla. February; 2015.
6. *+^Butts B, **Gary RA**, Dunbar S, Butler, J. Patterns of ASC Methylation are Associated with Ejection Fraction, Quality of Life and Depression in Persons with Heart Failure. Southern Nursing Research Society; February 2015; Tampa, FL.
7. *Higgins MK, Dunbar SB, **Gary RA**, Reilly CM, Butts, B. Modified scoring and analysis approach of the CHAMPS physical activity questionnaire and its relationship to six-minute walk physical functioning. Poster Presentation, Southern Nursing Research Society Annual Conference, Tampa, FL. February 2015.
8. *Butts B, **Gary RA**, Dunbar SB, Higgins MK. Barriers to Exercise in Persons with Heart Failure and Type 2 Diabetes Mellitus. Southern Nursing Research Society. San Antonio, Texas. February; 2014.
9. *+McGee B, Donovan M, Heath A, Hitro E, Rowland A, Serieno J, Scullin R, **Gary R**. Post-Traumatic Stress Disorder Symptoms following Acute Myocardial Infarction as a Predictor of Future Health Outcomes. Southern Nursing Research Society. February 2014; San Antonio, Texas.
10. *+Tomaso S, **Gary RA**, Higgins MK. The influence of exercise on physical and psychological function of family caregivers of persons with heart failure. Poster: Southern Nursing Research Society. San Antonio, Texas. February 2014; Best Student Poster.
11. *Butts B, **Gary RA**, Reilly CM, Culler S, Butler J, Dunbar, SB. Effect of an integrated heart failure and diabetes self-care intervention on quality of life and self-care behaviors. Poster presentation, Southern Nursing Research Society Annual Conference, Little Rock, AR. February; 2013.
12. *Ferranti E, Butler J, Reilly C, **Gary RA**, Culler S. Higgins MK, Dunbar SB. Self-Management of both Heart Failure and Diabetes: Perspectives from Patients and their Family Caregivers. Poster presentation at the Southern Nursing Research Society, Jacksonville, FL, Feb 2011 and the Nell Hodgson Woodruff School of Nursing Research Day, April, 2011.
17. *^Grossniklaus DA, Tohill BC, Frediani J, Lee J, Higgins MK, &**Gary RA**. Depressive symptoms are important correlates of dietary energy density in overweight adults. Southern Nurses Research Society Annual Conference, Baltimore, MD. February; 2010.
18. *^**Gary RA**, Dunbar SB, Clark PC, Cotsonsis GA.. Gender is not associated with depressive symptoms in heart failure. Southern Nursing Research Society. Birmingham, AL. February; 2008
19. *^ **Gary RA**, Dunbar SB, Clark PC, Reilly CM. Depression, physical function and quality of life in heart failure patients. Southern Nursing Research Society. Birmingham, AL. February; 2008.
20. *^Clark PC, Quinn C, **Gary RA**, McCarty F, Kaslow NJ, Smith AL, Dunbar SB. Influence of Perceived Support from Health Care Providers and Family on Depressive Symptoms in Patients with Heart Failure. Southern Nursing Research Society. Birmingham, AL. February; 2008.

21. *^Reilly CM, Clark PC, **Gary RA** Grossniklaus D, Lindsley K, Smith AL, Dunbar SB. Biobehavioral Correlates of Dietary Sodium Intake in Heart Failure Patients. Southern Nursing Research Society. Birmingham, AL. February; 2008.
22. *^Dunbar SB, Clark PC, Jacobson KL, McCarty F, Smith AL, Kovalchick L, **Gary RA**. Health Literacy in HF Patients and Family Caregivers. Southern Nursing Research Society. Birmingham, AL. February; 2008.

23. *^Dunbar SB, Clark PC, Quinn C, McCarty, F, **Gary R**, Kaslow N, Dashiff, C, Family Functioning and Heart Failure Caregiver Outcomes, oral presentation, Southern Nursing Research Society. Birmingham, AL. February; 2008.
24. ***^Gary, RA**. The psychometric testing of two fatigue instruments in heart failure patients. Nursing Research Conference, Emory University. Atlanta, GA. June; 2006.
25. *#^**Gary RA**. Depression and HF: preliminary findings. Boston Scientific/Guidant Corporation. Minneapolis MN. May; 2006
26. *#^**Gary RA**. Exercise and cognitive behavioral therapy as an intervention for depression in heart failure patients: preliminary findings. EPICORE, Emory University. Atlanta, GA. March; 2006
***Gary RA,** Dougherty MA pilot study comparing bio-impedance and anthropometric measurements inrural frail elders. Southern Nursing Research Society. Fort Worth, Texas. February 1997.

TEACHING ACTIVITIES

Courses Taught

01/2019	NRSG 505: Research and Evidence Based Practice	Coordinator
08/2019	NRSG 710: Health Outcomes Research	Coordinator
01/2018	NRSG 505: Research and Evidence Based Practice	Coordinator
08/2017	NRSG 710: Health Outcomes Research	Coordinator
01/2016	NRSG 505: Research and Evidence Based Practice	Coordinator
08/2015	NRSG 710: Health Outcomes Research	Coordinator
01/2015	NRSG 505: Research and Evidence Based Practice	Coordinator
08/2014	NRSG 710: Health Outcomes Research	Coordinator
01/2014	NRSG 507: Theory and Research Applications	Coordinator
08/2013	NRSG 440: Core Concepts II	Coordinator
01/2013	NRSG 507: Theory and Research Applications	Coordinator
08/2012	NRSG 440: Core Concepts II	Coordinator
08/2012	NRSG 763: Research Seminar and Residency	Coordinator
01/2012	NRSG 340: Core Concepts I	Coordinator
01/2012	NRSG 507: Theory and Research Application	Coordinator
08/2011	NRSG 763: Research Seminar and Residency	Coordinator
08/2011	NRSG 440: Core Concept II	Coordinator
05/2011	NRSG 507: Theory and Research Applications	Coordinator
01/2011	NRSG 471: Professional Development IV: Health Policy	Leader/Mentor
01/2011	NRSG 340: Core Concepts I	Coordinator
05/2010	NRSG 507: Theory & Research: Applications	Coordinator
01/2010	NRSG 507: Theory & Research: Applications	Coordinator
01/2010	NRSG 340: Core Concepts I	Coordinator
08/2009	NRSG 440: Core Concepts II	Coordinator
08/2009	NRSG 370: Professional Development I: Foundations of Professionalism	Mentor Group Leader Coordinator
01/2009	NRSG 474: Research Honors	Coordinator
01/2009	NRSG 340: Core Concepts I	Coordinator
08/2008	NRSG 473: Research Honors	Coordinator
01/2008	NRSG 763: Research Seminar & Residency I	Coordinator
01/2008	NRSG 474: Research Seniors Honors	Coordinator
01/2008	NRSG 371H: Research Junior Honors	Coordinator
08/2007	NRSG 762: Research Seminar & Residency I	Coordinator

08/2007	NRSG 473H: Research Senior Honors	Coordinator
08/2007	NRSG 370: Professional Development I: Professionalism	Mentor Group Leader
08/2007	NRSG 440: Core Concepts II	PBL Leader
01/2007	NRSG 371H: Research Junior Honors	Coordinator
08/2006	NRSG 762: Research Seminar & Residency I	Coordinator
05/2006	NRSG 560B: Cardiovascular Topics: Independent Study Course	Coordinator
01/2006	Tenure Track Research Sabbatical	
08/2005	Tenure Track Sabbatical	
05/2005	NRSG 507: Theory & Research: Applications	Coordinator
01/2005	NRSG 371: Professional Development II: Research	Coordinator
08/2004	NRSG 460M: Clinical Nursing III: Maturing & Aging Adults and Family	Coordinator

Doctor of Philosophy Nursing
Advisement

2015-2019 Fekadu Aga (Emory, Addis Ababa University) Dissertation Co-Chair
Title: Correlates of Type 2 Diabetes Self-Care Behaviors in the Context of Comorbid Heart Failure Fogarty Global Health Post-Doctoral Award

2018-presentLemlem Beza (Emory, Addis Ababa University) Dissertation Chair Title: Knowledge, attitudes and beliefs surrounding treatment seeking behaviors for persons with acute coronary syndrome in Addis Ababa, Ethiopia.
2018-presentSemarya Berhe (Emory, Addis Ababa University) Dissertation Chair Title: Cervical Cancer Screening Intention among Health care professionals at College of Health Sciences in Addis Ababa University; Using Psychometrically Tested Health Belief Model Clued by Trans-Theoretical Model: 2020

2013-2016 Brittany Butts (BSN-PhD) Dissertation Co-Chair Title: Effects of Exercise on Epigenetic Regulation of Inflammatory pathways in Persons with Heart Failure

2015-2016Mary Katherine (MK) Findley Dissertation Chair Title: Risk Factors of Recurrent Hospital Admission for Young Adults Presenting with Hyperglycemic Emergencies at an Inner-City Hospital

2016-present Emebet Woldaramian (Emory, Addis Ababa University) Dissertation Chair Title: Feasibility of the Braden scale for Pressure Injury Risk Assessment by Nurses Working in Intensive Care Units in Addis Ababa, Ethiopia
2015-presentDaniel Mengistu (Emory, Addis Ababa University) Dissertation Chair Title: Knowledge and risk perceptions of cardiovascular disease and risk reduction behaviors among adult hypertensive patients in Addis Ababa, Ethiopia.

2014-2018Blake McGee (BSN-PhD) Dissertation Chair Title: How does prescription drug spending affect medication adherence, acute care use, and health care costs in heart failure?

2011-2016Tingting Liu (BSN-PhD) Dissertation Chair Title: Comparison of Biological, Physical, and Psychological Risk Factors for Cardiovascular Disease in Overweight/Obese Individuals with and Without Prediabetes

2004-2009 Daurice Grossniklaus Dissertation Member
Title: Factors associated with Energy Dense Food Intake in Overweight Adults

2003-2006 Amy Valderrama Dissertation Reader
Title: Multidimensional factors associated with fatigue in persons with permanent atrial fibrillation

PROFESSIONAL AND UNIVERSITY SERVICE ACTIVITIES

Membership in Professional Organizations		Member
2019-Present	International Network for Doctoral Education in Nursing	
2005-Present	Council for the Advancement of Nursing Science	Member
2005-2011	Gerontological Society of America	Member
2002-Present	Heart Failure Society of America	Member
2002-Present	American Heart Association	Member
1979-Present	Sigma Theta Tau	Member
1985-Present	American Nurses Association, Georgia Nurses Association	Member

Editorships and Editorial Boards

2016-Present	Journal of Geriatric Cardiology	Editorial Board
Manuscript reviewer		Reviewer
2013-Present	Archives in Physical Medicine and Rehabilitation	
2012-Present	Heart	Reviewer
2008-Present	Journal of Cardiac Failure	Reviewer
2008-Present	Western Journal of Nursing Research	Reviewer
2005-Present	Heart Lung: Journal of Acute and Critical Care	Reviewer
2004-Present	Journal of Cardiovascular Nursing	Reviewer

National and International Scientific Review

2018-Present	NIH: Clinical Management of Patients in Community-based settings (CMPC)	
2009-2013	Greater Southeast Affiliate Research Committee, American Heart Association(AHA)	

National Committee Appointments		Co-Chair
2018-Present	Cardiovascular and Stroke Nursing Council Mentorship	Committee
2012-2018	Scientific Sessions, American Heart Association	Abstract Reviewer
2014-2018	AHA, Cardiovascular Disease in Older Populations Committee	Member
2009-2015	Cardiovascular Nursing Council Committee	Awards Committee
2008-2011	Cardiovascular Nursing Council Care of the Complex Patient	Member

Emory University Service

2012-Present	Scientific Advisory Council	Member

2012-Present	Atlanta Clinical Translational Science Institute	ADHOC Member
2012-2015	University Senate and Faculty Council	Member
2012-2015	Center for Faculty Development and Excellence	Board Member,
2006-2012	Scientific Advisory Council	Member
2006-2012	Atlanta Clinical Translational Science Institute formerly General Clinical Research Committee	Reviewer

Nell Hodgson Woodruff School of Nursing Service

2016-Present	Emory-Addis Ababa University	PhD in Nursing	Program Director
2016-2018	Research Committee		Chair
2016-2018	Ad hoc BSN Curriculum Committee		Member
2014-2016	Student Success and Monitoring Committee		Chair
2013-Present	T-32 Executive		Board Member
2013-Present	Search Committee		Board Member
2013-Present	PhD Executive Committee		Board Member
2012-Present	PhD Curriculum Committee		Member
2012-2014	PhD Admission Committee		Member
2012-2014	Admission Committee		Chair
2012-2014	Woodruff Scholar		Selection Committee
2012-2014	FULD Scholar		Selection Committee
2012-2013	PhD SACS		Review Committee
2011-Present	FACPT Committee		Member
2011-2012	Admission Committee		Co-Chair
2009-2011	Curriculum Committee		Chair
2007-2009	Curriculum Committee		Member

KATHERINE (Kate) A. YEAGER, RN, PhD, FAAN

Assistant Professor, Tenure Track

Nell Hodgson Woodruff School of Nursing

Emory University

Telephone: (404) 727-8627

Email: kyeager@emory.edu

Education

2012	PhD	Emory University	Nursing
1993	MS	University of California, San Francisco	Oncology Nursing
1984	BS	Emory University	Nursing
1982	BS	University of Georgia	Biology

LICENSES & CERTIFICATIONS

1984-Present	Registered Nurse	RN073801

HONORS & AWARDS

2019	High Five Award	NHWSN, Emory University
2019	Excellence in Leadership Award	NHWSN, Emory University
2018	Excellence in Social Responsibility Award	NHWSN, Emory University
2016	Inducted as Fellow	American Academy of Nursing
2016	Emory Williams Teaching Award	Emory University
2015	Abstract accepted as Finalist for the Mitchell Consortium	National Institute of Health
10th	Annual Max Award	Pain Symposium
2012	Outstanding PhD Student Award	NHWSN, Emory University
2009-2011	Doctoral Scholarship in Cancer Nursing	American Cancer Society
2008	Travel Scholarship NIH Summit: The Science	National Institute of Health of Eliminating Health Disparities
1992-1993	Masters Scholarship in Cancer Nursing	American Cancer Society
1992	The Jeanne Yalon Oncology Nurse Award	University of California Medical Center
1984	Inducted as a member	Sigma Theta Tau, Alpha Epsilon Chapter

PROFESSIONAL EXPERIENCE

2014-Present	Assistant Professor	NHWSN, Emory University

2012-2014	Research Assistant Professor	NHWSN, Emory University
2007-2010	Graduate Research Assistant	NHWSN, Emory University
1999-2007	Research Project Director	Rollins School of Public Health, Emory University
1997-1999	Clinical Instructor	NHWSN, Emory University
1995-1999	Research Project Manager	NHWSN, Emory University
1993-1994	Research Nurse	Winship Cancer Center
1993	Nurse Educator	University of California Medical Center, San Francisco
1988-1993	Clinical Nurse University of California Medical Center, San Francisco	University of California Medical Center, San Francisco
1986-1988	Clinical Nurse	Emory Crawford Long Hospital
1984-1986	Clinical Nurse Veterans Administration Medical Center, Decatur, GA	Veterans Administration Medical Center, Decatur, GA

SCHOLARSHIP: GRANTS & OTHER FUNDING

Research Grants Funded by the National Institutes of Health (NIH)

Oral Chemotherapy Adherence Trajectories in Chronic Myeloid Leukemia (Yeager)
Funded by NIH/National Cancer Institute (Grant #1 R01 CA236871-01)
Principal Investigator, 40%effort
Total costs: $1,843,645

Funding period: 04/01/19-03/31/23

Developing a Distance Education System to Train Savvy Caregiver Program Interventionists: Extending Access and Capacity in Community-Based Delivery of Evidence-Based Interventions (Hepburn)
Funded by NIH/National Institute on Aging (Grant# 1 R01 AG061971-01)

Co-Investigator, 7.5% effort

Total Costs: $2,076,725

Funding period: 9/30/ 2018-9/29/2022

NRG Oncology Network Group Operations Center/ NRG Oncology Foundation (Wolmark/Curran/Mannel)

Funded by NIH/National Cancer Institute (Grant # U10CA180868-05)
Chair, Health Disparities Committee ($15,000 subaward for 03/01/2019 – 02/29/2020)
Total costs: $9,000,000
Funding period: 03/01/2019 – 02/28/2025

Center for Cognitive and Affective Symptoms in Chronic Illness (Waldrop-Valverde)

Funded by NIH/National Institute of Nursing Research (Grant # 1P30NR014134-01)

Pilot: Cognitive and Affective Symptoms Associated with Cancer Pain among African Americans (Yeager)

Principal Investigator for Pilot, 10% effort

Total pilot cost: $221,659

12/1/2015-6/30/2017

Adherence in African Americans Being Treated for Cancer Pain (Yeager)

Funded by NIH/National Institute of Nursing Research (Grant #1K01NR014673)
Principal Investigator, 75%effort

Total costs: $275,283
Funding period: 09/27/2013 – 08/31/2016

Symptoms and Self- Management in Low Income African Americans with Advanced Cancer (Yeager)
Funded by NIH/National Institute of Nursing Research (Grant # F31 NR011383)
Principal Investigator, 75%effort

Total costs: $58,644
Funding period: 04/29/2010-12/31/2011

Research Grants Funded by Other Agencies

Examining the relationship between economic hardship and quality of life in the outpatient oncology palliative care setting: A pilot study. (Yeager, Belcher)

Co-Principal Investigator, No effort
Center for Nursing Excellence in Palliative Care, Emory University

Total costs: $14,898

Funding period: 4/15/2019-4/15/2020

Group dynamics within oncology conferences (Perry Smith)
Co-Investigator, No effort
Goizueta Creativity and Innovation Fund Grant
Funding period: 6/01/2017-6/01/2019

Winship Health Literacy Pilot Core: Optimizing Cancer Research and Treatment Trials (Waldrop-Valverde)
Funded by Winship Cancer Institute

Co-Investigator, No effort

Total Costs: $50,000

Funding period: 3/1/2016- 3/1/2018

Increasing Enrollment in Breast Cancer Clinical Trials Using Video Education (Yeager)
Funded by The V Foundation for Cancer Research

Principal Investigator,20%
Total costs: $65,000
Funding period:7/1/2015-1/31/2017

Serious Communicable Diseases Unit Care Team and the Ebola Virus Disease Challenge (Jennings)

Funded by American Nurses Foundation (Stryker Medical Research Award, Sayre Memorial Scholar)

Co-Investigator, No effort

Total costs: $14,999

10/1/15-9/31/16; NCE through 9/31/17

Frontline Care Providers and the Ebola Challenge (Yeager)

Funded by Alpha Epsilon Chapter of Sigma Theta Tau International

Co-Principal Investigator, No effort
Total costs: $1000 (startup funding for Jennings grant above)

Funding period: 03/19/2015- 03/18/2016

Caregivers Influence on Adherence to Cancer Pain Treatment for African American Cancer Patients (Yeager)

Funded by Pilot project grant from ACS/ Winship Cancer Institute of Emory University (Grant# IRG-14-188-01)

Principal Investigator, No effort
Total costs: $30,000

Funding period: 6/1/2015-8/31/2016

3

Patients Use of Coping Strategies for Acute Oral Pain (Yeager)
Oncology Nursing Foundation Novice Researcher and Mentorship Grant

Principal Investigator, 100% effort

Total costs: $5,000
05/01/1996-04/30/1999

SCHOLARSHIP: PUBLICATIONS (data-based denoted with *, senior or first author with +)

Yeager, K.A., Bai, J., Gogineni, K., Meisel, J.L., Kweon, J., Bruner D.W.& Waldrop-Valverde, D. (submitted). A Pilot Feasibility Study of a Video Intervention to Educate Patients with Breast Cancer about Clinical Trials . Breast Cancer Research and Treatment

Jessica M. Potts,[1] Betelihem Getachew, MPH,[1] Milkie Vu, MA,[1] Eric Nehl, PhD,[1] Katherine A. Yeager,Corinne R. Leach, PhD, MPH, MS,[3]& Carla J Berg (submitted). Use and perceptions of opioids versus marijuana among medical populations: Perspectives from people living with HIV and cancer survivors. American Psychologist

Stephanie L Pugh, S.L, Rodgers, J. Yeager, K.A., Chen, R.C., Movsas, B., Bonanni, R., Dignam, J. Bruner, D. W. (submitted) Participation in Patient-Reported Outcomes Components of NRG Oncology Clinical Trials. Quality of Life Research

1. Meghani, S.H., Wool, J., Davis, J., Yeager, K.A., Mao, J.J., & Barg, F.K. (accepted). When patients take charge of opioids: Self-management concerns and practices among cancer outpatients in the context of opioid crisis. Journal of Pain and Symptom Management.
2. Zackon, A., Ayers, A., **Yeager, K.A**. , Somma, M., Friedberg, J., Flowers, C.R., Nastoupil, L. (2019). Maximizing The Effectiveness of Oral Therapies in Lymphoid Cancers: Research Gaps and Unmet Needs. Leukemia and Lymphoma. Jun 4:1-9. doi: 10.1080/10428194.2019.1594217. Epub ahead of print
3. * +Jefferson K., Quest T., **Yeager K.A**. (2019). Factors Associated with Black Cancer Patients' Ability to Obtain their Opioid Prescriptions at the Pharmacy. Journal of Palliative Medicine. Mar 18. doi: 10.1089/jpm.2018.0536. Epub ahead of print
4. * +**Yeager, K.A**., Williams, B., Bai, J., Cooper, H.L.F., Quest, T., Meghani, S.H., Bruner D.W. (2019). Factors related to Adherence to Opioids in Black Patients with Cancer Pain. Journal of Pain and Symptom Management. 57(1):28-36. PMCID: PMC6310640.
5. * +Lal, A., Bai, J., Basri, D., **Yeager, K.A.** (2018). Pharmacists' perspectives on practice, availability, and barriers related to opioids in Georgia. American Journal of Hospice and Palliative Medicine. Dec 6,. doi: 10.1177/1049909118815440. Epub ahead of print
6. * +Bai, J. Brubaker, A. Meghani, S.H., Bruner D.W., **Yeager, K.A.** (2018). Spirituality and Quality of Life in Black Patients with Cancer Pain, Journal of Pain and Symptom

Management. Sep;56(3):390-398. doi: 10.1016/j.jpainsymman.2018.05.020. Epub 2018 May 30.

7. *** Jennings, B.M., Yeager, K.A., Feistritzer, N.R., Gullatte, M.M., & Martyn, K.K.** (2018)**. Enacting high reliability principles while caring for patients with Ebola Virus Disease. American Journal of Infection Control.** 46(10):1167-1173. doi: 10.1016/j.ajic.2018.04.208. Epub 2018 May 18.
8. * Cook, E.D., **Yeager, K.A.,**Cecchini, R.S., Boparai, J., Brown C.L., Duncan, M. Cronin, W.M., & Paskett, E.D. (2018)**.** Recruitment Practices for U.S. Minority and Underserved Populations in NRG Oncology: Results of an Online Survey. Contemporary Clinical Trials Communications. Mar 9;10:100-104. doi: 10.1016/j.conctc.2018.03.003.
9. * + **Yeager K.A**, Quest T.E., Vena C., & Sterk C.E. (2018) Living with Symptoms: A Qualitative Study of Black Adults with Advanced Cancer Living in Poverty. Pain Management Nursing. 19(1):34-45. doi: 10.1016/j.pmn.2017.10.017.
10. * Wells, J.S., Pugh, S., Boparai, K., Rearden, J., **Yeager, K.A**., & Bruner, D.W. (2017). Cultural Competency Training to Increase Minority Enrollment into Radiation Therapy Clinical Trials- An NRG Oncology/RTOG Study. Journal of Cancer Education. Dec;32(4):721-727. doi: 10.1007/s13187-016-1051-0. PMID: 27209044; PMCID: PMC5118189.
11. * Ferranti, E.P., Wands, L.M., **Yeager K. A.,** Baker, B.,Higgins, M.K., Wold, J.L., & Dunbar, S.B. (2016) Implementation of an Educational Program for Nursing Students Amidst the Ebola Virus Disease Epidemic. Nursing Outlook.Nov-Dec;64(6):597-603. PMID: 27364913 DOI:10.1016/j.outlook.2016.04.002.
12. Brooks S.E., Muller C.Y., Robinson W., Walker E.M., **Yeager K.A.**, Cook E.D., Friedman S, Somkin C.P Brown C.L., & McCaskill-Stevens W. (2015) Increasing Minority Enrollment Onto Clinical Trials: Practical Strategies and Challenges Emerge From the NRG Oncology Accrual Workshop. Journal of Oncology Practice. 11(6):486-90. PMID: 26464496.
13. * Bruner D.W., Pugh S.L., **Yeager K.A**., Bruner J., Curran W. (2015). Cartographic Mapping andTravel Burden to Assess and Develop Strategies to Improve Minority Access toNational Cancer Clinical Trials. International Journal of Radiation Oncology, Biology, Physics. 93(3):702-9. PMID: 26281827
14. **Yeager, K**., Bauer-Wu, S. Quest, T., Sterk. C. & Vena, C. (2015). Managing One's Symptoms: A Qualitative Study of Low-Income African Americans with Advanced Cancer. Cancer Nursing. 39(4):303-12. PMID: 26098399.
15. **+Yeager, K.A**& Bauer-Wu, S. (2013). Cultural Humility: Essential Foundation for Clinical Researcher.
    Applied Nursing Research, 26(4),251-256. PMID: 23938129
16. * McGuire, D.B., Reifsnyder, J., Soeken, K., Kaiser, K.S., &**Yeager, K. A**. (2011). Assessing Pain in Non-responsive Hospice Patients: Development and Preliminary Testing of the Multidimensional Objective Pain Assessment Tool. Journal of Palliative Medicine,14(3) 287-292. PMID: 21265631
17. * Whatley A.D., Diiorio C.K., &**Yeager K.** (2010). Examining the relationships of depressive symptoms, stigma, social support and regimen-specific support on quality of life in adult patients with epilepsy. Health Education Research, 25 (4) 575-84.PMID: 20167608
18. * Bauer-Wu, S., **Yeager, K.,** Norris, R.L., Liu, Q., Habin, K.R., Hayes, C., & Jurchak, M. (2009). Communication and planning at the end of life: A survey of women with advanced stage breast cancer.Journal of Communication in Healthcare, 2(4), 371-376.
19. * Walker, E.R., Wexler, B., DiIorio, C., Escoffery, C., McCarty, F., &**Yeager, K.A.** (2009). Content and characteristics of goals created during a self-management intervention for people with epilepsy. Journal of Neuroscience Nursing, 41 (6), 312-321. PMID: 19998682

20. * DiIorio, C., Escoffery, C., McCarty, F., **Yeager, K.A.,** Henry, T.R., Koganti, A., Reisinger, E.L., & Wexler, B. (2009). Evaluation of WebEase: an epilepsy self-management Web site.Health Education Research. 24(2):185-97. PMID: 18682382.
21. DiIorio, C., Escoffery, C., **Yeager, K.A.,** McCarty, F., Henry, T.R,, Koganti, A., Reisinger, E., Robinson, E., Kobau, R., Price, P. (2009). WebEase: development of a Web-based epilepsy self-management intervention.Preventing Chronic Diseases. 6(1):A28. PMID: 19080034.
22. * DiIorio, C., Reisinger, E.L., **Yeager, K.A.,**& McCarty, F. (2009). A telephone-based self-management program for people with epilepsy. Epilepsy and Behavior.14(1):232-6. PMID: 19010447.
23. * Robinson, E., DiIorio, C., Depadilla, L., McCarty, F., **Yeager, K.,** Henry, T., Schomer, D.L. & Shafer, P.O. (2008). Psychosocial predictors of lifestyle management in adults with epilepsy. Epilepsy and Behavior, 13(3):523-8. PMID: 18595777
24. * DiIorio, C., McCarty, F., Resnicow, K., McDonnell Holstad, M., Soet, J., **Yeager, K.,** Sharma, S.M., Morisky, D.E., & Lundberg, B. (2008). Using motivational interviewing to promote adherence to antiretroviral medications: a randomized controlled study. AIDS Care, Mar;20(3):273-83. PMID: 18351473
25. * DiIorio, C., Reisinger, E., **Yeager, K**., Schomer D.L., & Henry T. (2008). A descriptive analysis of seizure events among adults who participated in a computer-based assessment. Journal of Neuroscience Nursing, 40(3):134-41. PMID: 18578271
26. * Escoffery, C., DiIorio, C., **Yeager, K.A.,** McCarty, F., Robinson, E., Reisinger, E., Henry, T., & Koganti, A. (2008). Use of computers and the Internet for health information by patients with epilepsy. Epilepsy and Behavior, 2(1):109-14. PMID: 17959420
27. Bauer-Wu, S., Barrett, R., &**Yeager K.** (2007). Spiritual Perspectives and Practices at the End-of-Life: A Review of the Major World Religions and Application to Palliative Care. Indian Journal of Palliative Care, 13(2), 53-58
28. * DiIorio, C., McCarty, F., Depadilla, L., Resnicow, K., Holstad, M. M., **Yeager, K.,** et al. (2007). Adherence to Antiretroviral Medication Regimens: A Test of a Psychosocial Model. AIDS Behavior, 13(1):10-22. PMID: 17978868
29. Pluhar, E., McDonnell Holsad, M. **Yeager, K.A**., Densmore-Nwagbara, P., Corkran, C., Fielder, B. McCarty, F & DiIorio, C., (2007). Implementing computer assisted interviewing methods in behavioral research. Journal of the Association for Nurses in AIDS Care., Volume 18(4), 51-63. PMID: 17662924
30. * DiIorio, C., Shafer, P.O., McCarty F., Letz, R., Henry, T., Schomer, D.L. &**Yeager, K.A**. (2006). Behavioral, social, and affective factors associated with self-efficacy for self-management among people with epilepsy. Epilepsy & Behavior, 9(1): 158-163. PMID: 16798100
31. * DiIorio, C., McDonnell, M., McCarty, F., &**Yeager,K**. (2006).Initial testing of the Antiretroviral Medication Complexity Index**.** Journal of the Association of Nurses in AIDS Care. 17(1):26-36. PMID: 16686082
32. * +**Yeager K**., DiIorio C., Shafer P., McCarty F., Letz R., Henry T., & Schomer D.L. (2005). The complexity of treatments for persons with epilepsy. Epilepsy & Behavior. 7(4):679-86. PMID: 16150652
33. * +DiIorio, C., Shafer, P., Letz, R., Henry, T., Schomer, D., &**Yeager, K**. (2004). Project EASE: a study to test a psychosocial model of epilepsy medication management. Epilepsy & Behavior, 5 (6), 926-936. PMID: 15624235
34. DiIorio, C., **Yeager, K.,** Donahue, B., Wasserman, J., Postier, A., & Broderick, L. (2004). An evaluation of neuroscience nursing research published during the decade of the brain. Journal of Neuroscience Nursing, 36(2): 58-66, 71. PMID: 15115359

35. * +DiIorio, C., Resnicow, K., McDonnell, M., Soet, J., McCarty, F., &**Yeager, K**. (2003). Using motivational interviewing to promote adherence to antiretroviral medications: a pilot study. Journal of Association of Nurses in AIDS Care. 14(2), 52-62
36. * Letz, R., DiIorio, C.K., Shafer, P.O., **Yeager, K.A**., Schomer, D.L., & Henry, T.R. (2003). Further standardization of some NES3 tests. Neurotoxicology, 24, 491-501. PMID: 12900062
37. * Letz, R., DiIorio, C.K., Shafer, P.O., **Yeager, K.A**., Henry, T.R., & Schomer, D.L. (2003). A computer-based reading test for estimating premorbid general intellectual level in North American English-speaking adults. Neurotoxicology, 24, 503-512. PMID: 12900063
38. * DiIorio, C., Shafer, P., Letz, R., Henry, T., Schomer, D., &**Yeager, K.** (2003). The association of stigma with self-management and perceptions of health care among adults with epilepsy. Epilepsy and Behavior, 4, 259-267. PMID: 12791327
39. * DiIorio, C., **Yeager, K.**, Shafer, P., Letz, R., Henry, T., Schomer, D., & McCarty, F. (2003). The epilepsy medication and treatment complexity index: reliability and validity testing. Journal of Neuroscience Nursing, 35(3): 155-162. PMID: 12830663
40. * DiIorio, C., Resnicow, K., McDonnell, M., Soet, J., McCarty, F., &**Yeager, K.** (2003). Using motivational interviewing to promote adherence to antiretroviral medications: A pilot study. Journal of the Association of Nurses in AIDS Care, 14(2), 52-62. PMID: 12698766
41. **+ Yeager, K.A**., Webster, J., Crain, M., Kasow, J., & McGuire, D.B. (2000) Implementing an oral care standard. Cancer Nursing. 23(1). 40-8. P.MID: 10673806
42. McGuire, D.B., DeLoney, V.G., **Yeager, K.A**., Owen, D.C., Peterson, D.E., Lin, L.S., & Webster, J. (2000). Maintaining study validity in a changing clinical environment. Nursing Research, 49(4): 231-235. PMID: 10929695
43. * McGuire, D.B., **Yeager, K.A**., Dudley, W. N., Peterson, D.E., Owen, D.C., Lin, L.S., & Wingard, J.R. (1998). Acute oral pain and mucositis in bone marrow transplant patients: Data from a pilot study. Cancer Nursing, 21, 385-393. PMID: 9848996
44. * Messias, D. K. H, **Yeager, K.A**., Dibble, S., & Dodd M.J. Patients' perspective of fatigue while undergoing chemotherapy. (1997). Oncology Nursing Forum, 24 (1): 43-8. PMID: 9007906
45. * +**Yeager, K.A.,** Miaskowski C., Dibble, S. & Wallhagen, M. (1997) Differences in pain knowledge in cancer patients with and without cancer pain. Cancer Practice: a Multidisciplinary Journal of Cancer Care, 5(1): 39-45. PMID: 9128495
46. * +**Yeager, K.A.,** Miaskowski C., Dibble, S. & Wallhagen, M. (1995) Differences in pain knowledge and perceptions of the pain experience between outpatients with cancer pain and their family caregivers. Oncology Nursing Forum, 22 (8): 1235-41. PMID: 8532548
47. * +**Yeager, K.A**. & Miaskowski C. (1994). Advances in understanding the mechanisms and management of acute myelogenous leukemia. Oncology Nursing Forum, 21 (3): 541-8. PMID: 8052550

Peer-Reviewed Publications – Submitted/Under review

1. *+Kang, Y. Meghani, S.H., Bruner, D.W., **Yeager, K. A.** (under review) Factors Associated with Depression in African American Patients Being Treated for Cancer Pain. Pain Management Nursing
2. * Meghani, S. H., Jesse Wool, J., Davis, J., **Yeager, K.A**., Mao, J.J., &Barg, F.K. (under review) When patients take charge: Patients' self-management for cancer pain in the context of societal concerns about opioids. Journal of Pain and Symptom Management.

Other Publications- Book Chapters

1. Book chapter: Bauer-Wu, S.M., Cooley M.E., **Yeager K.** (2011) Clinical nursing research: Current perspectives and future trends. In: Gullatte M.M., editor, Nursing Management and Leadership: Principles and Practice. (2nd edition). Pittsburgh, PA: Oncology Nursing Press
2. Book chapter: DiIorio, C.,&**Yeager, K.** (2003) The Epilepsy Self-Efficacy Scale. In O.L. Strickland & C. DiIorio (Eds.), Measurement of Nursing Outcomes: Self Care and Coping, Vol II, (2nd ed). New York: Springer Publishing Company
3. Book chapter:**Yeager, K.A**., McGuire, D., & Sheidler, V. R. (2000). Assessment of cancer pain. In C.H. Yarbro, M.H Frogge, M. Goodman, & S. L. Groenwald (Eds.), Cancer Nursing: Principles and Practices. (5th ed). (pp. 633-656). Sudbury: Jones and Bartlett
4. Book chapter: McGuire, D., &**Yeager, K.** (1999). Implementing the study. In M.A. Mateo & K.T. Kirchhoff (Eds.), Conducting and Using Nursing Research in the Clinical Setting. (2nd ed). (pp. 300-315). Philadelphia: W.B. Saunders
5. Book chapter:**Yeager, K**. (1995). Tumor lysis syndrome. In Miaskowski, C. (Ed.), Planning Care Specialty: A Nursing Diagnosis Approach-Oncology. New York: Delmar Publishers

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SCHOLARSHIP: PRESENTATIONS (podium presentations denoted with ^)

International Presentations

1. **Yeager, K.A**., Bai, J., Paul, S., Waldrop-Valverde, D. Cognitive And Affective Symptoms Associated with Cancer Pain among African Americans. Poster presentation at Multinational Association of Supportive Care in Cancer. June 21-23, 2019, San Francisco, CA.
2. Bai, J., Bruner, D. W., Hepburn, K. W., &**Yeager, K.** Dyadic Analysis of Patient-Caregiver Congruence on Cancer Pain Assessment and its associations with Opioids Adherence in African Americans. Poster presentation at the International Cancer Education Conference, Oct 3-5, 2018, Atlanta, GA.
3. **Yeager, K.A.,** Quest, T., & Bauer-Wu, S. The symptom experience of low income African Americans with advanced cancer. Poster Presentation at the 16th International Conference on Cancer Nursing. March 7-11, 2010, Atlanta, GA.
4. ^Bauer-Wu, S., Cooley, M., **Yeager, K**., Whitworth, R., Litrownik, D., Cassels, L., Nguy, S. & Reed, G. Predictors of symptom experience in hematopoietic stem cell transplant patients: A longitudinal study.Podium Presentation at the 16th International Conference on Cancer Nursing. March 7-11, 2010, Atlanta, GA.
5. ^McDonnell, M., DiIorio, C., Donahue, B., McCarty, F., **Yeager, K**. Long-term adherence monitoring with the Medication Event Monitoring System (MEMS): are we closer to a gold standard? Podium and poster presentation at International Conference on Adherence to Antiretroviral Therapy: Elements of Success. December 2-4, 2004, Dallas, TX.
6. ^McDonnell, M., DiIorio, C., McCarty, F., **Yeager, K.,** Wang. Socio-demographic and quality of life variables associated with adherence to ART. Podium Presentation at International Conference on Adherence to Antiretroviral Therapy: Elements of Success, December 5-8, 2002, Dallas, TX.
7. ^Letz R., DiIorio C.K., Shafer P.O., **Yeager K.A.,** Henry T.R., Schomer D.L. A computer-based reading test for estimating premorbid general intellectual level in North

American English-speaking adults. Podium Presentation at the Eighth International Symposium on Neurobehavioral Methods and Effects in Occupational and Environmental Health. June 23-26, 2002, Brescia, Italy.

8. Letz R., DiIorio C.K., Shafer P.O., **Yeager K.A**., Schomer D.L., Henry T.R. Further standardization of some NES3 tests. Podium Presentation at the Eighth International Symposium on Neurobehavioral Methods and Effects in Occupational and Environmental Health. June 23-26, 2002, Brescia, Italy.

National Presentations

2020 Group on Diversity and Inclusion (GDI) Professional Development Conference
May 1 – 4, 2020
JW Marriott
Miami, Florida
United States

1. Belcher, S.M., Curseen, K.A., Lal, A., Nguyen J., Gantz, L.,& Yeager, K.A. (accepted). Exploring financial hardship and quality of life in patients with advanced cancer in the ambulatory palliative care setting. Moderated Poster Presentation at the Oncology Nursing Society 45th Annual Congress, May 1, 2017, San Antonio, TX.
2. Lee, S. M., Bruner, D.W., Meghani, S., & Yeager, K.A. (accepted) **Taking Opioids for cancer pain: Experiences of adult African American being treated for pain**, Poster Presentation at the Oncology Nursing Society 45th Annual Congress, May 1, 2017, San Antonio, TX.

3. Lee, H., Bai, J., Waldrop-Valverde, D., Paul, S. & Yeager, K.A. (accepted). Congruence of pain perceptions between African American cancer patients and their caregivers. Podium Presentation at the Oncology Nursing Society 45th Annual Congress, April 30, 2017, San Antonio, TX. (in B**est of Research Abstracts Session)**

3. Wolf, R., **Yeager, K.A**., Caudle, J., Wan, C., Barnes, C.S., Zoemer, D.C. Patents feel responsible for self-care and understand that clinic visits are vital, but want more interim support. Poster presentation at the American Diabetes Association's 79th Scientific Sessions. June 7-11, San Francisco, CA.
4. Lal, A., Barsri, D., Bing, K &**Yeager, K.A.** Pharmacists' perspectives: practice procedures, availability, and barriers related to opioids. Poster Presentation at the American Pain Society's Scientific Summit, March 4 - 6, 2018, Anaheim, CA.
5. **^Yeager, K.A.,** Williams, B., Meghani, S., Cooper, H., Quest, T., & Bruner, D.W. Opiate adherence in African Americans being treated for cancer pain. Podium Presentation at the Oncology Nursing Society 42nd Annual Congress, May 4, 2017, Denver CO.
6. **Yeager, K.A,** Cronin, W.M. Cecchini, R.S., Duncan, M., Boparai, J., Cook, E.D., Brown, C.L., & Paskett, E. D. Recruitment practices for minority and underserved populations in NRG Oncology: Results of an online survey. Poster Presentation at the Ninth AACR Conference on The Science of Cancer Health Disparities in Racial/Ethnic Minorities and the Medically Underserved, September 25 - 28, 2016, Fort Lauderdale, Fla.
7. **Yeager, K.A**., Meghani, S.H., Cooper, H.F., Quest, T., Williams, B., Kweon, J., Haight, S. & Bruner, DW. Opiate adherence in African Americans being treated for cancer pain. Poster Presentation at the American Pain Society 35th Annual Scientific Meeting, May 11-14, 2016, Austin, TX.
8. Rueschenberg, A., **Yeager, K.A**., & Haight, S. Predictors of depression in African Americans being treated for cancer pain. Poster Presentation at Oncology Nursing Society Annual Congress, April 28-May 1, 2016. San Antonio, TX.
9. Brubaker, A. **Yeager, K.A.,**& Haight, S. Spirituality and quality of life in African Americans being treated for cancer pain. Poster Presentation at SNRS 30th Annual

Conference**, February 24-27, 2016,** Williamsburg**,** VA. (Received 1st place in the Minority Health Research Student category).

10. **Yeager, K.A.,** Meghani, S.H., Cooper, H., Kewada, P. Quest, T. Williams, B. & Bruner, DW. Adherence in African Americans being treated for cancer pain, Invited poster at NIH 10th Annual Pain Consortium Symposium, May 26-27, 2015. Bethesda, MD.
11. **Yeager, K.A**., Bruner, J. Pugh, S.L. & Bruner, D.W.. Clinical trial participation: Differences in distance traveled across different ethnic groups. Poster Presentation at the American Association for Cancer Research Conference on The Science of Cancer Health Disparities in Racial/Ethnic Minorities and the Medically Underserved, December 6-9, 2013. Atlanta, GA.
12. **Yeager, K.A**., Bauer-Wu, S. & Vena, C. The Symptom experience of low-income African Americans with advanced cancer. Poster Presentation at the 2012 Science of Eliminating Health Disparities Summit. December 17-19, 2012. Washington DC.
13. **^ Yeager, K.A**., Bauer-Wu, S. & Vena, Self-Management of symptoms experienced in low income African Americans with advanced cancer. Podium Presentation at 2012 Oncology Nursing Society Connections Conference . November 16-18, 2012. Phoenix, AZ .
14. **Yeager, K.A**., & Bauer-Wu, S. Facilitators and barriers to coping with cancer in low-income metastatic breast cancer survivors: A qualitative analysis. Poster Presentation at the 5th Biennial Cancer Survivorship Research Conference. June 17-19, 2010, Washington DC.
15. **^ Yeager, K**., DiIorio, C., McDonnell, M., McCarty, F Sharma, S., Weaver, L. The values clarification component of a motivational interviewing intervention for adults with HIV. Podium Presentation at the HIV Nursing Research Summit. April 22-24, 2005, Palm Springs, CA
16. ^ DiIorio, C., McDonnell, M., McCarty, F Sharma, S., **Yeager, K**., Weaver, L. The impact of a motivational interviewing intervention on adherence to antiretroviral medications among adults with HIV. Podium Presentation at the HIV Nursing Research Summit. April 22-24, 2005, Palm Springs, CA
17. DiIorio, C., McDonnell, M., McCarty, F., Sharma, S., **Yeager, K**., Weaver, L., Donahue, B. A Model of medication adherence among HIV+ Adults. Poster Presentation at the 2004 National State of the Science Conference. October 6-9, 2004. Washington, D.C.
18. DiIorio, C., Shafter, P., Letz, R., Schomer, D. Henry, T., **Yeager, K**. Understanding The link between the burden of epilepsy and depression on self-management in adults with epilepsy. Poster presentation at the American Epilepsy Society/ American Clinical Neurophysiology Society Annual Meeting. December 5-10, 2003, Boston, MA.
19. Shafer, P., DiIorio, C., **Yeager, K**., Pennell, P., Krishnamurthy, K., Letz, R., Schomer, D., Henry, T. Self-management practices and health behaviors of women with epilepsy. Poster presentation at the American Epilepsy Society/ American Clinical Neurophysiology Society Annual Meeting. December 5-10, 2003. Boston, MA.
20. DiIorio, C., McDonnell, M., McCarty, F., Sharma, S., **Yeager, K**., Iversen, H., Wang, T., Donahue, B. The association between stigma and selected psychosocial self-management, and health care variables among adults with HIV. Poster presentation to the 16th Annual Conference for the Association of Nurses in AIDS Care. November 2003, New York.
21. **Yeager, K**., Iversen, H., DiIorio, C., McDonnell, M., McCarty, F., Wang, T, Sharma, S, Donahue, B. Motivation and maintenance: challenges in recruitment and retention. Roundtable presentation to the 16th Annual Conference for the Association of Nurses in AIDS Care, November 2003, New York.
22. **Yeager, K.,** DiIorio, C., McDonnell, M., McCarty, F., Sharma, S., Iversen, H., Wang, T., Donahue, B. Religious coping in adults with HIV. Poster presentation to the 16th Annual Conference for the Association of Nurses in AIDS Care, November 2003, New York.

23. **^ Yeager, K.,** DiIorio, C, Yeager, K., Shafer, P., Richardson, C., Henry, T., Schomer, D., Letz, R. Self-management practices of persons with epilepsy. Podium Presentation at the American Association of Neuroscience Nurses 35th Annual Meeting. April 5-8, 2003, Atlanta, GA.
24. ^ Shafer, P., DiIorio, C, **Yeager, K**., Richardson, C., Henry, T., Schomer, D., Letz, R. Outcomes for epilepsy management - what do patients expect? Podium Presentation at the American Association of Neuroscience Nurses 35th Annual Meeting. April 5-8, 2003, Atlanta, GA.
25. ^ Richardson, C., DiIorio, C, **Yeager, K**., Shafer, P., Henry, T., Schomer, D., Letz, R. Are there differences in the self-management practices of African American adults with epilepsy? Podium Presentation at the American Association of Neuroscience Nurses 35th Annual Meeting. April 5-8, 2003, Atlanta, GA.
26. ^ DiIorio, C, **Yeager, K**., Shafer, P., Richardson, C., Henry, T., Schomer, D., Letz, R. Factors associated with epilepsy self-efficacy. Podium Presentation at the American Association of Neuroscience Nurses 35th Annual Meeting. April 5-8, 2003, Atlanta, GA.
27. ^ DiIorio, C., Shafer, P., Henry, T., Schomer, D., Letz, R., **Yeager, K**., McCarty, F. The assessment of an instrument to measure perceived stigma among adults with epilepsy. Podium Presentation at the American Epilepsy Society 56th Annual Meeting. December 6-11, 2002, Seattle, Washington.
28. DiIorio, C., McDonnell, M., **Yeager, K**., Moore, H., McCarty, F., Wang, T., Sharma, S. Personal values and goals that motivate antiretroviral medication adherence. Poster presentation at 15th Annual Conference for the Association of Nurses in AIDS Care. November 2002, San Francisco.
29. Moore, H., **Yeager, K**., DiIorio, C., McDonnell, M., McCarty, F., Wang, T., Sharma, S. Measuring medication adherence using a medication event management system. Poster presentation at 15th Annual Conference for the Association of Nurses in AIDS Care, November 2002, San Francisco.
30. **Yeager, K**., DiIorio, C., McDonnell, M., Moore, H., McCarty, F., Wang, T., Sharma, S. The Personal and public view of stigma among adults with HIV. Poster presentation at 15th Annual Conference for the Association of Nurses in AIDS Care, November 2002, San Francisco.
31. Shafer, P., DiIorio, C., **Yeager, K.,** Letz, R., Henry, T., Schomer, D. The use of alternative therapies among adults with epilepsy. Poster presentation at the American Epilepsy Society/ American Clinical Neurophysiology Society Annual Meeting. December 3-5, 2001, Philadelphia, PA.
32. **Yeager, K**., DiIorio, C., Shafer, P., Letz, R., Henry, T., Schomer, D. Development of the epilepsy medication treatment complexity index. Poster presentation at the American Epilepsy Society/ American Clinical Neurophysiology Society Annual Meeting. December 3-5, 2001, Philadelphia, PA.
33. DiIorio, C., Shafter, P., **Yeager, K**., Letz, R., Henry, T., Schomer, D. Perceived stigma and depression among adults with epilepsy. Poster presentation at the American Epilepsy Society/ American Clinical Neurophysiology Society Annual Meeting. December 3-5, 2001, Philadelphia, PA.
34. **^ Yeager, K.A**. Dunne, M.M. McGuire, D.B. Patients' use of coping strategies for acute oral pain. Podium Presentation at the Oncology Nursing Society Annual Congress, May, 1998, San Francisco, CA.
35. **Yeager, K.A.** Clapper, L., McGuire, D.B. Challenges in studying bone marrow transplant patients. Poster presentation, Seattle Marrow Transplant Nursing Consortium's Sixth International Conference, October, 1997, Seattle, WA
36. **^ Yeager, K.** DeLoney, V. Crooker, S., Webster, J. McGuire, D.B. Integrating intervention research into the clinical setting. Podium Presentation at the American

Cancer Society 4th National Conference on Cancer Nursing Research, January, 1997, Panama City, FL.

37. **Yeager, K.A**. Clapper, L., McGuire, D.B. Challenges in developing and implementing an oral care standard for hematology and BMT patients: working toward 100% acceptability. Moderated poster presentation, Oncology Nursing Society Annual Congress, May, 1996, Philadelphia, PA.
38. **Yeager, K.A**, Miaskowski C., Dibble, S., Wallhagen, M. Differences in pain knowledge and experience between oncology outpatients and their caregivers. Poster presentation, Oncology Nursing Society Annual Congress, May, 1994, Cincinnati, OH.
39. **Yeager, K.A.**, Dibble, S. Dodd, M. Dibble, S. Wallhagen, M. The experience of fatigue among patients receiving chemotherapy. Poster presentation, May, 1993, Oncology Nursing Society Annual Congress.

State/Regional Presentations

1. Lyon H. G., Bai, J., Bruner, D. W., Hepburn, K. W., &**Yeager, K**. Skipping pain medication: opioid use in African American patients with cancer pain. Poster presentation at New Directions in Nursing Research and Evidence-Based Practice, Nov 17, 2018, Atlanta, GA.
2. Kweon, J., Margolis, L., Gogineni, K.; Waldrop-Valverde, D., Bruner, D. &**Yeager, K.,** Development, acceptability and feasibility of a patient education video on cancer clinical trials for breast cancer patients, Poster Presentation (Top Student Posters Session) at the Southern Nursing Research Society 31st Annual Conference, February 23, 2017, Dallas, TX.
3. **Yeager, K.** Listening to stories of pain. Presentation at Healthcare Ethics Consortium, Are we hearing our patients' voices? Atlanta, GA. **March 17-18, 2016.**
4. **Yeager, K.** Ethics education for nurses. Poster Presentation at Healthcare Ethics Consortium, Hope and Limits: Cradle to Grave Ethical Care. Atlanta, GA. **March 19-20, 2015.**
5. **^ Yeager, K.A**., Higgins,M. K., Quest, T.E. & Bauer-Wu,S. The symptom profile of cancer patients in a public, inner-city hospital palliative care clinic. Podium presentation at the Southern Nursing Research Society 2012 Annual Conference, New Orleans, LA. February 22-25, 2012
6. **Yeager, K.,** End of life decision making. Invited presentation at Oncology Nursing Symposium, March 21, 2009, Stone Mountain Georgia.
7. DiIorio, C., McCarty, F., McDonnell, M., **Yeager, K**., Wang, T., Iversen, H., Weaver, L., Donahue, B. Psychosocial Correlates of Medication Adherence, Self-Efficacy for adherence and outcome expectancy for adherence among HIV+ adults.Poster presentation at the Southern Nursing Research Society Eighteenth Annual Conference. February 20, 2004. Louisville, Kentucky.
8. ^ DiIorio, C., (Symposium Coordinator), Shafer, P., Henry, T., Schomer, D., Letz, R., **Yeager, K.**, Project E.A.S.E. Work Group. Symposium on epilepsy self-management: A comprehensive approach to disease management.Podiums Presentation at the Southern Nursing Research Society Seventeenth Annual Conference. February 13-15, 2003, Orlando, Florida. Included four papers for presentation:

   Epilepsy self-management: theory and research. (Overview paper) Presenter-DiIorio, C.

   Epilepsy self-management: model testing for medication and information management. Presenter-DiIorio, C.

   Epilepsy self-management: complementary therapies and the patient's perspective. Presenter- Shafer, P.

3 Epilepsy self-management: role of medication complexity. Presenter-**Yeager, K.**

9. Richardson, C., DiIorio, C., **Yeager, K**. Seizure events among epileptic adults who participated in a computer-based self-management assessment. Podium Presentation at the Georgia Public Health Association 73rd Annual Meeting and Conference, September 4-6, 2002, Atlanta, GA.

TEACHING ACTIVITIES

Courses Taught

Spring 2019 Lecturer	NRSG 732, Theoretical & Scientific Bases Clinical Phenomena	Guest
Spring 2019	NRSG 332, Scholarly Inquiry Coordinator	
Spring 2019	NRSG 454 Honors Thesis II Coordinator	
Fall 2018	NRSG 331, Scholarly Inquiry Coordinator	
Fall 2018	NRSG 453 Honors Thesis I Coordinator	
Fall 2018 Lecturer	N101, Intro to Professional Nursing	Guest
June 2018 Lecturer	VANAP-GE Residency Didactic Day, Ethical Care in the Veteran Population	Guest
Summer 2018	NRSG 416-001, Perspectives in Professional Nursing: Research Coordinator	
Spring 2018	NRSG 454 Honors Thesis II Coordinator	
Spring 2018 **Lecturer**	NRSG 730, **Measurement and Design in Clinical Research**	**Guest**
Spring 2018	NRSG 732, Theoretical & Scientific Bases Clinical Phenomena Lecturer	Guest
Spring 2018	NRSG 332, Scholarly Inquiry Coordinator	

Spring 2018	N101, Intro to Professional Nursing Lecturer	Guest
Fall 2017	NRSG 309-1, Social Responsibility & Bioethics in Nursing (ABSN) Coordinator	
Fall 2017	NRSG 331 Scholarly Inquiry Coordinator Fall 2017 N101, Intro to Professional Nursing Guest Lecturer	
Summer 2017	NRSG 416-001, Perspectives in Professional Nursing: Research Coordinator	
Spring 2017	NRSG 332, Scholarly Inquiry Coordinator	
Spring 2017	N734, Qualitative Research Methods Coordinator	
Spring 2017	N101, Intro to Professional Nursing Lecturer	Guest
Fall 2016	NRSG 416-001, Perspectives in Professional Nursing: Research Coordinator	
Fall 2016	N101, Intro to Professional Nursing Lecturer	Guest
Spring 2016	N734, Qualitative Research Methods Coordinator	
Spring 2016	N101, Intro to Professional Nursing Lecturer	Guest
Summer 2015	N503, Adv. Practice Nursing: Ethical, Legal &Leadership Issues Coordinator	
Spring 2015	N734, Qualitative Research Methods Coordinator	
Spring 2015	N371 Professional Development II: Evidence Coordinator	
March 2015	N324, Case Study Analysis I –Ethical Dilemma in Healthcare Lecturer	Guest
March 2015	N505, Research and Evidence Based Practice-Qualitative Research Lecturer	Guest
March 2015	NRSG 371H Honors Research-Qualitative Research Lecturer	Guest

January 2015	N505, Research and Evidence Based Practice-Qualitative Research	Guest Lecturer
Fall 2014	N370 Professional Nursing: Concepts, Issues, and Trends	Coordinator
Summer 2014	N503, Adv. Practice Nursing: Ethical, Legal &Leadership Issues	Coordinator
Spring 2014	N371 Professional Development II: Evidence	Coordinator
March 2014	N507 Research and Evidence Based Practice-Qualitative Research	Guest Lecturer
February 2014	N440 Caring for patients with Cancer lecture, Core Concepts II	Guest Lecturer
Fall 2013	N370 Professional Nursing: Concepts, Issues, and Trends	Faculty
Nov. 2013	N507 Research and Evidence Based Practice-Qualitative Research	Guest Lecturer
Summer 2013	N372 Professional Nursing: Concepts, Issues, and Trends	Faculty
Spring 2013	N371 Professional Development II: Evidence	Faculty
March 2013	N507 Research and Evidence Based Practice-Qualitative Research	Guest Lecturer
March 2013	N440 Caring for patients with Cancer lecture, Core Concepts II	Guest Lecturer
Fall 2012	N370 Professional Nursing: Concepts, Issues, and Trends	Faculty
Nov. 2012	N507 Research and Evidence Based Practice-Qualitative Research	Guest Lecturer
Summer 2012	N372 Professional Nursing: Concepts, Issues, and Trends	Faculty
Spring 2012	N371 Professional Development II: Evidence	Faculty
March 2012	N440 Caring for patients with Cancer lecture, Core Concepts II	Guest Lecturer
February 2011	N440 Caring for patients with Cancer lecture, Core Concepts II	Guest Lecturer
October 2010	N440 Caring for patients with Cancer lecture, Core Concepts II	Guest Lecturer

Spring 2010	N371 Professional Development II: Evidence Based Nursing Practice Teaching Associate	
Fall 2009	N370 Professional Development I: Foundations of Professionalism Teaching Associate	
April 2007	N733 Project Management/Process Evaluation	Guest Lecturer
May 2006	N733 Project Management/Process Evaluation	Guest Lecturer
April 2005	N733 Project Management/Process Evaluation Lecturer	Guest
March 2003	N733 Project Management/Process Evaluation Lecturer	Guest
Spring 1998	N340 Care of Adults with Acute and Chronic Pain Lecturer	Guest
February 1998	GI Complications of BMT, Bone Marrow Transplant Orientation	Guest Lecturer
July 1997	GI Complications of BMT, Bone Marrow Transplant Orientation	Guest Lecturer
February 1997	GI Complications of BMT, Bone Marrow Transplant Orientation	Guest Lecturer
1995	N605 Management of Oral Care Problems, Adult Oncology Seminar Lecturer	Guest
1993	Hospital Orientation, UCSF Medical Center Coordinator &	Lecturer
1990-1992	Cancer Curriculum Series,UCSF Medical Center Coordinator &	Lecturer

Doctor of Philosophy Nursing Advisement

2018-Present	Haerim Lee Dissertation Committee Chair	

The Relationship to Symptoms, Body Fat Composition, and Sexual Function in Women with Endometrial Cancer

2016-2019	Gaea Daniels	Dissertation Committee Member

Exploring the Associations of HealthBehaviors, Socio-demographic Factors, and Vaginal Symptoms with the Vaginal Microbiome in Postmenopausal Women (successfully defended July 22, 2019)

2017-Present Semarya Berhe
Dissertation Committee Member

Cervical Cancer Screening Intention Among Female Health Care Professionals Working at The College of Health Sciences of Addis Ababa University; Using Psychometrically Tested Health Belief Model Clued By Trans-Theoretical Model: 2020

Honors Research BSN Advisement

2018 Hadley Lyon `Summer Undergraduate Research Experience (SURE) Research Mentor

2016-2017 Sarah Febres-Cordero BRIDGES to the Baccalaureate Program Mentor

2014-2016 Andrea Brubaker
Honors Program Research Advisor

2014-2016 Allyssa Rueschenberg
Honors Program Research Advisor

PROFESSIONAL AND UNIVERSITY SERVICE ACTIVITIES

Membership/Service in Professional Organizations

2018-Present Cancer Care Delivery Research, NRG Oncology ,National Cancer Institute Member

2018-Present National Cancer Institute National Cancer Advisory Board *ad hoc* Working Group on Strategic Approaches and Opportunities in Population Science, Epidemiology, and Disparities Invited Member

2017-Present Patient Engagement NRG Oncology Working Group Member

2017-Present National Cancer Institute NCORP Disparities Integration Working Group; Health Literacy Research Interest Group InvitedMember

2017-Present The Lymphoma Epidemiology of Outcomes (LEO) Cohort Study Survivorship Workgroup Invited Member

2016-Present Disparities Integration Working Group, National Cancer Institute Invited Member

Community Oncology Research Program
2015-2019 American Pain Society's Pain and Disparities' Special Interest
Member-at-large Group Board

2015-2016 Oncology Nursing Advanced Research
Special Interest Group Member
Leadership Council

2014-2015 Emory Ethics Leadership Academy
Member
2013-Present American Pain Society
Member
2014-Present Health Disparities Committee of NRG
Oncology, National Chairperson
Cancer Institute
2013-2014 Special Populations Committee of Radiation
Therapy Oncology Chairperson Group
2013-Present Cancer Prevention and Control Research Program of Winship
Member
Cancer Institute of Emory University
2012- Present American Nurses Association
Member
2010- Present Georgia Nurses Association
Member
2007-Present Oncology Nursing Society
Member
1994-1999 Metro Atlanta Chapter of Oncology Nursing
Society Member
1992-1993 Nursing Pain Association, San Francisco, CA
Member
1991-1993 Bay Area Oncology Nursing Society
Program Committee
Member
1989-1999 Oncology Nursing Society
Member
1988-1993 California Nursing Association
Member
1984-Present Sigma Theta Tau, International Honor
Society in Nursing Member

Editorships and Editorial Boards

2013-Present Oncology Nursing News Contributor/Editorial
Board

Manuscript Reviewer

2016-Present Cancer Nursing
Reviewer

2016-Present	Journal of the National Cancer Institute	Reviewer
2015-Present	Pain Medicine Reviewer	
2014-Present	Research in Nursing & Health	Reviewer
2014-Present	Journal of Health Care for the Poor and Underserved	Reviewer

Emory University Service

2019-Present	2019-Present	
2019-Present	Common Read Committee	Member
2018-Present	Advising Philosophy Committee	Member
2018-Present	Faculty Thought Leaders Committee (FTLC), the Social Justice Education (SJE)	Member
2018-Present	Emory Public Scholars Institute Participant	Member
2017	Search Committee for the Nursing Informationist position, WHSC Library, Emory	Member
2016-Present	Winship/ American Cancer Society Institutional Research Grant Executive Committee	Member
2015-Present	Faculty Facilitators for Unconscious Bias Training/ Trainer for Unconscious Bias for Faculty Search Committees	Member
2015-2019	Faculty Advisory Committee for Emory Integrity Project	Member
2015-2017	Planning committee for Healthcare Ethics Consortium Annual Conference	Member
2015-2016	Planning committee for Liaison to Recruitment Innovation Centers- Emory ATCI	Member
2011	Transforming Community Project National Workshop for Higher Education Institutions	Facilitator

2010	Transforming Community Project Community Dialogue, Grady Health Sciences	Facilitator
2008-2009	Honorary Degree Committee	Member

Nell Hodgson Woodruff School of Nursing Service

2019-Present	PhD Preliminary Exam Committee	Member
2018-Present	Faculty Liaison for the PhD Student Experience	Liaison
2019-Present	Search Committee for Associate Dean for Research	Member
2018-Present	ORCHARD (Oncology interest group)	Chair
2018-Present	Emory Williams Teaching Award Committee	Member
2018-Present	T32 Executive Committee (T32NR012715-06)	Member
2017-Present	PhD Student Advisory Board	Faculty co-advisor
2017-Present	Division on Community and Diversity	Co-Chair
2016-2018	Advisory Committee for Addis Abba UniversityPhD Program	Member
2016	Center for Nursing Excellence in Palliative Care Strategic Planning Workgroup	Member
2016-Present	Finance Advisory Committee	Member
2015-Present	PhD Ethics Training Coordinator	
2015-2017, 2019	PhD Admissions Committee	Member
2013-2016	Diversity Task Force	Member
2013-Present	Emory Multicultural Nursing Student Association	Faculty Advisor
2012-2015	Woodruff Fellow Selection Committee	Member
2015	Selection Committee, Susan D. Flynn Memorial Oncology Nursing Externship	Member

Other Community Service

2010	Avon Foundation Community Education and Outreach Initiative	Presenter

2007-2011	American Cancer Society Hope Lodge, Cancer Resource Center	Volunteer
1996	Program Committee, Georgia Cancer Pain Initiative Regional Workshop	Member

CURRICULUM VITAE
Mitike Molla Sisay (PhD)

PERSONAL DATA

Date of Birth: December 3, 1960
Place of Birth: Addis Ababa, Ethiopia
Home Address: Nifassilk Lafto Sub City, Woreda 03, Keble 03, House number 1852E
Telephone: +251 911131805, P.O.Box 40860
Office Address: Addis Ababa University, Main Campus, Presidential Building
Telephone: +251 691112397
Email: mitikemolla@gmail.com, mitike.molla@aau.edu.et;

Position Title	Employer	Date	Major activities performed
Vice President for Research and Technology Transfer	Addis Ababa University	06/01/2019	Leading research, community services, technology transfer and Addis Ababa Press.
Dean of the School of Public Health (SPH)	Addis Ababa University	14/09/17 to 05/01/19	Management, leadership, supervision, mentoring, teaching, research, and community services
Associate Professor of public health (SPH)	AAU	03/01/15-14/09/17	Teaching, supervision, research, mentoring and program management
Assistant Professor (SPH)	AAU	01/01/09-02/31/15	Teaching, supervision, research and programs
Senior M and E Officer (SPH)	Population Council, Addis Ababa	03/01/08-12/31/09	Leading vulnerable girls' programs, program design and evaluation, training local NGOs working in SRH and girls' program. Writing policy briefs and designing and conducting conferences and meetings for dissemination.
Research Assistant, Butajira Rural Health program (SPH)	AAU	April 2002-July 2003	Data quality assurance, research and supervision
Head Planning and Programming Service	Addis Ababa Health Bureau	Nov. 1995 –Jan, 1999	Planning health programs including; designing the first HSDP; Health capital budgets for the region; evaluation of NGO projects; leading and monitoring NGOs working on health activities in the Region and over all M and E of the regional health activities.
Gandhi Memorial Hospital, Administrator	Addis Ababa Health Bureau	Mar. 1994- July 1994	Management and leadership of the Hospital activities
Nurse practitioner Assab, Sene 18th and Ethio-Swedish	Ministry of Health of Ethiopia	Sept. 1979-1993	Served as a midwife, pediatric nurse and outpatient and inpatient care and treatment, ward management

Pediatric Hospitals in Ethiopia			

EDUCATION AND TRAINING

Year	Institution and certification
2011-2012	Post-Doctoral Fellow, Emory, Rollins School of Public Health, Department of Global Health, Atlanta, USA
2004-2009	PhD, Centre for International Health, Faculty of Medicine, University of Bergen, Norway.
1999-2000	Department of Community Health, Faculty of Medicine Addis Ababa ty,
1986-1993	Bachelor Degree in Business Management, Faculty of Business and Economics, Addis Ababa University
1977-1979	Diploma in Nursing, Centralized School of Nursing, Addis Ababa

Short courses since 2012

Year	Institution	Courses
June 15-July 03-3015	Johns Hopkins University, Bloomberg School of Public Health: Summer Institute	○ Introduction to qualitative research, ○ Qualitative data analysis, ○ Conducting epidemiological studies ○ Social epidemiology June
Mid-June-July 2012.	Johns Hopkins University, Bloomberg School of Public Health: Summer Institute *(Part of the Post Doc fellowship)*	○ Longitudinal Data Analysis, ○ Multi-Level Modelling, ○ Comparative Effectiveness Analysis, Epidemiology of HIV, ○ Management of Clinical Trials and Epidemiological use of GIS,

PROFESSIONAL EXPERIENCE:

Editorial activities

- Associate Editor for Ethiopian Journal of Reproductive Health (EJRH)
- Editorial Board Member and Section Editor for the Ethiopian Journal of Health Development
- Reviewer for several international and national peer reviewed journals (BMC series, Social Science and Medicine, Global coaction, AIDS care, Africa Journal of AIDS, Gynecology are some of them)

Community services and university Affairs:

President Ethiopian Public Health association since March 2019
Board Member Arbaminch University since November 2019
Board Chair AAU Press
Board Chair Institute of Land and Water Resources
Board Chair Horn of Africa Regional Environment Network
RAC member MoSHE
RAC member MiNT
Ethiopian Academy of Sciences Fellow

RESEARCH (grants and publications)

Research grant participation

- Narrowing the gender gap in research: empowering female faculty at the College of Health Sciences Thematic research Grant AAU 2017-2020 PI
- Complex interventions in health care with focus on children and adolescents with long-term illness in Ethiopia. Grant number 2016-05706 (2017-2019)
- NIH grants MEPI-II, Junior faculty D43: Grant number 5D43TW010143-2. Aim is to create research capacity for Junior Faculty at Addis Ababa University, Medical Faculty, College of Health sciences. M responsibility is program lead for RH
- NIH, Fogarty Grant with JHU: Optimizing HIV Prevention in Ethiopia through Implementation Science 2013-2017. D43TW9582 Co-funding: NIMH. Aim is to create research capacity on implementation research related to HIV AIDS. (Co-director)
- John & Katie Hansen Family Foundation to the President and Fellows of Harvard College on behalf of Harvard School of Public Health. Sub Grant 2012 – 2013 (Country PI)

Publications:

Focusing on the continuum of adolescent, maternal, newborn and child health, behavioral health sciences, gender-based violence, and Health and Demographic Surveillance System (HDSS), I have published more than 50 articles, a book chapter in public health and two monographs. Publications are listed here under using four areas based on my main focus area; Adolescent, maternal, child health and demography.

I. Adolescent and youth reproductive health (Rape, early marriage, STIs and HIV vulnerability and mortality) (13 articles)

1. **Molla M,** Ismail S, Kumie A, Kebede F: Sexual violence among female street adolescents in Addis Ababa. Ethiop J Health Dev 2002, 16(2):119-128
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14. Getachew TH, Rawstorne P, Molla MS, and Nathan S. Beliefs and intention of heterosexual couples about undertaking Couple's HIV Testing and Counselling (CHTC) services in Ethiopia.BMC Health Services Research (2020) 20:92 https://doi.org/10.1186/s12913-020-4947-7.

II. Maternal Health (health service use for delivery, companionate care, impact of maternal deaths and more) 17 articles

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IV. Demography: Data from HDSS (6 articles)

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3. A rural Ethiopian Population undergoing epidemiological transition over a generation: Butajira from 1987 to 2004. Berehane Y., Wall S., Fantahun M., Emeline A., Hogberg U., Worku A., Tesfaye F., **Molla M** et al. Scan J Public Health. 2008;36:436-41

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2. Shemsedin Toyba, Sisay Gashu, Fiona Braka**, Mitike Molla**, Balcha Masresha, Implementing Best Practice Measles SIAs The Ethiopia Experience *(Monograph*) 2011
3. **Mitike Molla**, Kidist Lulu .Women's policy implementation In Ethiopia: 2000 *(Monograph)*

Appendix- I Declaration

Declaration

Letter for declaration (Dissertation work)

I, the undersigned, declared that this is my original work, has never been presented in this or any other university, and that all the resources and materials used for the dissertation, have been fully acknowledged.

Name: Semarya Berhe Lemlem

Signature:  Date: 26/06/2024

Place: Addis Ababa university, College of Health Sciences, School of Nursing and Midwifery, Ethiopia

Date of Submission:

This dissertation has been submitted for examination with my approval as University Supervisor.

Name: Rebecca A. Gary, RN, PhD, Professor, **Primary Advisor**

Signature:  Date: 26/06/2024

Place: Emory University, Nell Hodgson Woodruff School of Nursing, USA

Katherine A. Yeager, RN, PhD, Associate Professor

Signature  Date: 26/06/2024

Place: Emory University, Nell Hodgson Woodruff School of Nursing, USA

Mitike Molla Sisay, PhD, Professor

Signature:  Date:01/07/2024

Place: Addis Ababa University, College of Health Sciences, School of Public Health, Ethiopia

Melinda K Higgins, PhD, Professor

Signature: Melinda Higgins Date: 07/01/2024

Place: Emory University, Nell Hodgson Woodruff School of Nursing, USA

Appendix- J Original papers

PLOS ONE

RESEARCH ARTICLE

Psychometric properties of a modified health belief model for cervical cancer and visual inspection with acetic acid among healthcare professionals in Ethiopia

Semarya Berhe Lemlem[1☯]*, **Rebecca A. Gary**[2☯], **Katherine A. Yeager**[2☯], **Mitike Molla Sisay**[3☯], **Melinda K. Higgins**[2☯]

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Abstract

Purpose

Evidence supports that the Health Belief Model (HBM) can explain and predicts certain health behaviors, including participation in cervical cancer (CC) screening. The purpose of this study was to evaluate the psychometric properties of a modified HBM for CC and visual inspection with acetic acid (VIA) in female healthcare professionals in Addis Ababa, Ethiopia, 2020.

Methods

Psychometric properties related to CC and VIA were tested using 42-item modified HBM self-administered questionnaire and a cross-sectional study design with simple random sampling. Kaiser-Meyer-Olkin and Bartlett's sphericity test indicated that data sampling adequacy for exploratory factor analysis was 0.792 ($\chi 2 = 3189.95$, df = 351, $p < .001$). Items with cross-loading and factor loadings ≥ 0.5 were retained. Confirmatory factor analysis (CFA) was conducted to determine model fit.

Results

The final analysis included 194 women, (mean age 30±4.34). Twelve items with ≤ 0.5 were removed and 30 retained items loaded into 6 factors; (benefits of VIA, perceived seriousness of CC, barrier (fear of negative outcome), self-efficacy, susceptibility to CC, and barriers (health system delivery)) explained 65% of the total variance. Cronbach's alpha for the total instrument was 0.8 and reliability for the 6 subscales was 0.76–0.92. Composite reliability and average variance extracted indicated good internal consistency and convergent validity. CFA identified 6 additional items to be removed with high residual covariance. The final 24 items of the modified HBM had an acceptable model fit (goodness-of-fit index (GFI)

number: https://doi.org/10.20372/aau_rdr/GXJ5UR.

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Competing interests: The authors have declared that no competing interests exist.

= 0.861, adjusted GFI = 0.823, comparative fit index = 0.937, root mean square error of approximation = 0.059).

Conclusion

The modified HBM for CC and VIA with 24 items had adequate psychometric properties and may be used by Ethiopian healthcare professionals for research or clinical purposes. To support external validity the updated 24 items tool is suggested for application in further study in different populations in Ethiopia.

Introduction

The global burden of cervical cancer is projected to continue to increase, rising to approximately 700,000 diagnosed, with an estimated 400,000 deaths in 2030. Most of these increases will be among women in low and middle income countries (LMICs), reflecting the severity of the global divide in cervical cancer morbidity and mortality [1, 2]. In LMICs, including Ethiopia, cervical cancer the leading cause of death. In 2010, the Ethiopian Ministry of Health reported that there were 4,648 new cases and 3,235 deaths due to cervical cancer, equating to a mortality rate of 18.4/10000 [3–5].

Screening is the single most important public health strategy to reduce cervical cancer incidence and consequent mortality [6, 7]. Survival rates for cervical cancer in Sub Saharan Africa are 21% compared with 70% in the USA and 66% in Europe [8, 9]. Despite the negative clinical outcomes associated with cervical cancer in Ethiopia, approximately 27.19 million women are estimated to be at risk, yet less than 1% of women aged 18–69 years undergo screening every 3 years, as recommended by the World Health Organization (WHO, 2014) and adopted by Ethiopia [10–12]. Effective, low resource screenings and treatment methods are recommended in the WHO guideline, which includes use of "see and treat" screening strategy with visual inspection with acetic acid (VIA) as the primary screening method and cryotherapy as a treatment option [4].

Research to date indicates that the availability of screening services is inadequate to increase screening participation [10, 13, 14]. Further some behaviors and beliefs may significantly impact the decisions of women to take preventive actions against cervical cancer [15]. Much of the work associated with cancer screening has been informed by the Health Belief Model (HBM). The HBM focuses on preventing illness occurrence by encouraging health behaviors that avoid disease [15]. Researchers have reported that diverse demographic, psychosocial, and health beliefs may influence cervical screening perceptions and, thus, indirectly influence health-related behavior [16]. To improve screening participation among women, a better understanding of their health beliefs is essential [17].

There is considerable empirical support that HBM can explain and predict certain health behaviors, particularly cancer screening [16]. For behavior change to occur such as obtaining cervical cancer screening, people must perceive a threat from their current behavioral patterns (perceived susceptibility and severity) and believe that change of a specific behavior will result in a valued outcome at an acceptable cost (perceived benefit). Individuals also must feel competent (self-efficacy) to overcome perceived barriers to taking action [18].

One of the most important limitations in both descriptive and intervention research regarding HBM has been variability in the measurement of central HBM constructs. Construct definitions need to be consistent with HBM theory as originally conceptualized, and measures need to be specific to the behavior being addressed and relevant to the population among

whom they will be applied [19]. The reliability of instruments may differ among populations for various reasons, including socio-demographic factors and cultural nuances.

Testing a modified version of the HBM scale modified for cervical cancer and VIA among women in Ethiopia will contribute to and expand knowledge in this area. A survey conducted among Ethiopian healthcare professionals revealed a significant deficit regarding cervical cancer, which could have implications for future screening programs since these providers would likely play a principal role in patient education and implementation of a cervical cancer screening program in Ethiopia [18]. Cervical screening behaviors among healthcare professionals working at the College of Health Sciences in Ethiopia have not previously been examined using a modified version of Champion's HBM. Therefore, the objective of this study was to evaluate and validate the psychometric properties of the modified HBM scale for Cervical Cancer and VIA (42) questionnaire in female Ethiopian healthcare professionals.

Methods

Study design and settings

A cross-sectional study design was used to test the psychometric properties of the modified HBM for cervical cancer and VIA for application in female healthcare professionals working at the College of Health Sciences at Addis Ababa University, Ethiopia in 2020.

Sample size

The sampling frame for this study was based on participants' profile obtained from the office of human resource. Simple random sampling was used to select the participants' who fulfills the inclusion criteria being female healthcare professionals aged 21–65 years, no prior history of cervical cancer, speaks English and employed full-time. For this survey students and non-health care professionals were excluded from the study. Samples were proportionally allocated based on the number of female staffs available in the units/ departments. Health care professionals who fulfil the inclusion criteria and willing to participate were approached face to face to fill out the semi structured questionnaires. For psychometric testing, there are a wide range of recommendations for adequately powered analysis ranging from 3 participants to 1 item to 5:1 [19]. In the current study a 5:1 ratio of participants to items was used to perform exploratory factor analysis (EFA). The modified HBM scale to be tested included 42 items, bringing the required number of participants to 210. Given the 24 items in the final modified version presented here the 5:1 ratio increased to 8.75:1.

The study received ethical approval from the Institutional Review Board of Addis Ababa University (protocol number, 017/20/-Nursing) before its initiation. Written informed consent was collected from all participants. All potential participants were informed about the purpose, method and potential benefits and knowledge gained from the study. Data for the psychometric evaluation were collected from June to August 2020.

Instruments

A structured questionnaire was used to collect socio-demographic data including age, marital status, work experience, profession, income and level of education. In addition, questions about prior cervical cancer screening practice were included.

The modified HBM scale for cervical cancer and VIA use

The HBM questionnaire used in the current study was modified from the HBM Scale for Cervical Cancer and Pap Smear Test reported by Guvenac (2011), which had been previously

modified from Champion's HBM by inclusion of four additional question to the barrier construct [20]. The self-efficacy construct was not tested by Guvenac (2011) and was considered to be a modified HBM scale. The following HBM constructs were included: susceptibility, seriousness, benefits/ motivation, barriers, health motivation, and self-efficacy. The modified HBM scale was further adapted for this study to refer to cervical cancer screening as VIA since the Pap smear is not widely used in Ethiopia. Visual inspection with acetic acid (VIA) is visualization of woman's cervix to detect precursors of cervical cancer after application of acetic acid (ordinary table vinegar) on her cervix and it is a simple, low-cost, and efficient alternative to cytologic testing in low-resource areas [21]. The Health Belief Model Scale for Cervical cancer and VIA has 42 items and six subscales, including benefit (8 items), barrier (18 items), seriousness (7 items), susceptibility (3 items), health motivation (3items), and for self-efficacy (3 items). All subscale items have the following five-point Likert-type response choices: strongly disagree (1 point), disagree (2 points), neutral (3 points), agree (4 points), and strongly agree (5 points). Permission to test the modified instrument and to adapt the scale for use by women in Ethiopia was obtained from Guvenac.

Data analysis and presentation

Data were screened for missing and outlier values and data entry errors using the frequency distributions of the variables and by inspection of entered data. Data were exported to SPSS version 25 software for analysis.

Construct validity of the scale was examined using EFA and principal axis factoring (PAF) extraction with oblimin rotation. The loading criterion was set as ≤ 0.3 and Bartlett's tests was used to analyze sampling adequacy. Reliability included internal consistency and was estimated using Cronbach alpha coefficient values for the different domains of the instrument. Cronbach's alpha between 0.70–0.90 is considered to reflect adequate internal consistency [22].

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was used to quantify sufficiency of item correlation for performing factor analysis. The KMO index ranges from zero to one and, the minimum acceptable value is 0.60. Bartlett test of sphericity test was applied to assess the presence of correlations among variables significant value ($p < 0.05$) indicates the appropriateness of EFA [23]. Generally, the results indicated strong factorability and supported conducting an EFA.

Factor extraction analysis was conducted using PAF to determine the number of factors to retain, as follows: (a) using the Guttmann- Kaiser greater-than-one rule which recommends that only those factors with eigenvalues ≥ 1.0 be retained; (b) using the Cattell scree test, which involves constructing 16 plots of extracted factors against their eigenvalues in descending order of magnitude; (c) by applying the Monte Carlo Parallel analysis rule, which compares factor eigenvalues to a set of eigenvalues generated from random data, and recommends retaining those eigenvalues that exceed the corresponding values from the random data; and, (d) by calculating the amount of total variance explained by the communality of each variable to determine the number of factors to be preserved [24]. PAF was conducted together with oblique rotation (direct oblimin) which is often seen as producing more accurate results for research involving human behaviors. Regardless of which rotation method is used, the main objectives are to provide easier interpretation of results, and produce a solution that is more parsimonious [25] Items were deleted from the EFA if factor load was < 0.5, loaded on more than one factor, or not loaded on any factor [25].

In confirmatory factor analysis (CFA), model fitness was assessed by (a) over model fitness, using the Chi test $\chi 2$ (p) ($p > 0.05$) and normed (Chi-square and df ratio) $\chi 2$ (CMIN/df) ≤ 3;

(b) incremental fitness with comparative fit index (CFI) and normed fit index (NFI) ≥ 0.95 and; (c) absolute fitness with, goodness-of-fit index (GFI), adjusted GFI (AGFI) ≥ 0.80, root mean square residual (RMR) ≤ 0.08, and root mean square error of approximation (RMSEA) ≤ 0.06 [26]. The method used to potentially further refine /remove items from the instrument was with load <0.3 or, higher covariance, and estimates of the residual variance.

The criteria for convergent validity were as follows composite reliability $\geq \pm 1.97$ ($p < 0.05$); and average variance extracted (AVE) ≥ 0.50 [27].

Participant's demographic characteristics were summarized using descriptive statistics. Categorical variables are presented as percentages and frequencies.

Inclusivity in global research

Additional information regarding the ethical, cultural, and scientific considerations specific to inclusivity in global research is included in the Supporting Information (S1 Checklist).

Results

Socio-demographic characteristics

We approached 210 female participants at the College of Health Sciences. Variables were checked for outliers based on the Mahalanobis distance and 16 cases with $p< 0.001$ were excluded from the analysis resulting a final study sample of 194 female healthcare professionals (response rate 92.4%) working at Addis Ababa University College of Health Sciences, with mean age $33.14^{\pm}7.2$ years. The majority of participants 150 (77.3%) worked in the clinics and 102 (52.6%) had < 5years of work experience. The socio-demographic characteristics of participants are presented in Table 1.

Participant screening practice

The majority of the women healthcare professionals 138 (71.1%) enrolled in the study had not been previously screened for cervical cancer in their life time. Only 33 (17.0%) of the sample had been screened for cervical cancer in the past three years and the remaining 161(83.0%) had not.

Validity and reliability

The KMO and Barlett tests were conducted done before the EFA. KMO should be 0.6 to continue with factor analysis. In more detail, KMO values with 0.90 are considered excellent; 0.80 good, 0.70 middle range; 0.60 mediocre; 0.50 acceptable; and ≤ 0.50 is unacceptable [28]. The KMO measurement of sampling adequacy was 0.792, and the Bartlett's test of sphericity was significant ($\chi 2 = 3189.95$, df = 861, $p < .001$) indicating the adequacy of the sample (n = 194) for EFA.

The Cronbach's alpha value for total items was 0.80 and the reliability coefficient values calculated for each sub dimension were 0.92 for benefit of VIA, 0.87 for perceived seriousness of cervical cancer, 0.87 for barrier (fear of negative outcome), 0.82 for self-efficacy, 0.76 for susceptibility to cervical cancer, and 0.80 for barriers (health system delivery).

Exploratory factor analysis

Decisions regarding the number of extractable factors included in EFA were made using eigenvalues, factor loadings, and scree plot diagrams. Initial PAF showed the presence of nine factors with eigenvalues > 1. A review of the scree plot revealed a break before four factors. Supporting Catelli's scree test, Monete Carlo parallel analysis showed seven factors with

Table 1. Socio-demographic characteristics of health care professionals working in College of Health Sciences Addis Ababa University (n = 194).

Variables	Category	Frequency	Percent %
Age	< 30 Years	101	52.1
	30–34 years	40	20.6
	35–39 Years	23	11.9
	≥ 40 Years	30	15.5
Marital Status	Single	76	39.2
	Married	108	55.7
	Others	10	5.2
Service Year	<5 years	102	52.6
	5–10 Years	51	26.3
	>10 years	41	21.1
Educational level	BSc	124	63.9
	Masters	44	22.7
	MD	20	10.3
	Others*	6	3.1
Monthly income (ETB)	≤6193	77	39.7
	6194–9056	71	36.6
	>9056	46	23.7
Professional stream	Clinical	150	77.3
	Academic	39	20.1
	Both	5	2.6
Professional title	Nurse	128	66.0
	Midwife	18	9.3
	Physicians	22	11.3
	Others**	26	13.4
Unit of work	Medical ward	29	14.9
	Surgical ward	22	11.3
	Oncology	21	10.8
	Outpatient	44	22.7
	Others***	78	40.2

Note: Others: Widowed and divorced;

*: Diploma and PhD;

**, anesthetist, pharmacy, laboratory, radiology;

*** EPI, FP, etc

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eigenvalues surpassing the corresponding criterion values for a randomly generated data matrix of the same size for ample EFA. Parallel analysis is a consistent and acceptable method used to precisely decide the number of factors [28]. Of 42 items30 were retained and total of twelve items were eliminated based on factor loading lower than 0.5, cross-loading, or a communality value < 0.40.

A key component analysis of the scale revealed that six factors had values > 1. Of the factors revealed by oblimin rotation, the first one explained 19.01% of the total variance, while the second to sixth explained 12.594%, 10.018%, 6.526%, 4.789%, and 4.424% respectively; the variance explained by all six factors was 65%. Factor analysis identified that the first factor, benefits of VIA included 8 items; the second factor perceived seriousness of cervical cancer had 6 items; the third barrier to negative health outcome had 3 items, the fourth self- efficacy had 5 items; the fifth susceptibility to cervical cancer had 3 items, the sixth barriers to health

delivery had 5 items. Items in the health motivation subscale changed sub scale and were loaded on the self-efficacy sub scale, and the barrier sub scale was divided into two factors, while the remaining items remained in their original subscales. Factor load values of the items in the first to sixth factors were: 0.635 to 0.834, while it was 0.602–0.857, 0.571–0.956, 0.553–0.835, 0.585–0.900, and 0.576–0.772 respectively in Table 2.

To check internal consistency Cronbach's alpha and composite reliability coefficients calculated for the six factors. In addition, AVE values were estimated to assess convergent validity. Both alpha and composite reliability ≥ 0.70 and AVE ≥ 0.5 reflect adequate internal consistency and convergent validity. Cronbach's alpha, composite reliability, and AVE values were calculated for each factor, and good values were obtained for all subscales in Table 3.

Confirmatory factor analysis

Based on EFA conducted out in the initial phase, a six-factor model of the modified HBM and VIA questionnaire was evaluated using a randomly allocated sample (N = 194) by CFA.

Table 2. Factor loading for EFA with oblimin rotation modified HBM for VIA-30 among health care professionals, Ethiopia 2022.

ITEM	BEN	SER	BAR 1	EFF	SUS	BAR 2
6 Maintaining good health is extremely important to me	.834					
1 Having regular VIA will help to find changes to the cervix, before they turn into cancer	.826					
5 I want to discover health problems early	.815					
8 I feel it is important to carry out activities which will improve my health	.797					
3 I think that having a regular VIA is the best way for cervical cancer to be diagnosed early	.757					
7 I look for new information to improve my health	.732					
4 Having regular VIA will decrease my chances of dying from cervical cancer	.720					
2 If cervical cancer was found at a regular VIA test its treatment would not be so bad	.635					
29 I am afraid to think about cervical cancer		.857				
27 The thought of cervical cancer scares me		.802				
28 When I think about cervical cancer, my heart beats faster		.799				
32 If I had cervical cancer my whole life would change		.676				
30 Problems I would experience with cervical cancer would last a long time		.621				
31 Cervical cancers would threaten a relationship with my boyfriend, husband, or partner		.602				
10 I am afraid to have a because I don't know what will happen			.956			
9 I am afraid to have VIA for fear of a bad result			.954			
12 I would be ashamed to lie on a gynecologic examination table and show my private parts to have a VIA			.571			
41 I feel capable of getting a VIA test.				.835		
42 I feel capable of managing any emotional distress caused by VIA test				.792		
40 I feel capable of arranging to have a VIA test.				.641		
38 I exercise at least 3 times a week for my health				.603		
39 I have regular health check-ups even when I am not sick				.553		
36 I feel I will get cervical cancer sometime during my life					.900	
34 It is likely that I will get cervical cancer in the future					.680	
35 My chances of getting cervical cancer in the next few years are high					.585	
25 My partner does not want me to get VIA						.772
26 It is difficult to get an appointment for VIA						.751
22 I will never have a VIA if I have to pay for it						.630
24 The VIA may move the intrauterine device						.577
23 I do not have time to get VIA						.576

Note, n = 194. Factor loadings > .5 only presented. BEN: Benefit of VIA, SER: Perceived seriousness of cervical cancer, BAR 1: Barrier fear of negative outcome, EFF: Self-efficacy, SUS: Susceptibility to cervical cancer, BAR 2: Barrier to health delivery

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Table 3. Cronbach's alpha, composite reliability and AVE for each factor of modified HBM for cervical cancer and VIA among health care professionals, Ethiopia.

Factor name	No of items	α Cronbach	CR	AVE
	30 items (item11,13,14,15,16,17,18,19,20,21,33,37 removed)			
Benefits of VIA	8	0.92	0.92	0.59
Perceived Seriousness of cervical cancer	6	0.87	0.87	0.54
Barrier Fear of negative outcome	3	0.87	0.88	0.72
Self-efficacy	5	0.82	0.82	0.48
Susceptibility to cervical cancer	3	0.76	0.77	0.54
Barrier Health delivery	5	0.80	0.80	0.44
	26 items (item7, 5, 39 and 22 removed)			
Benefits of VIA	7	0.90	0.91	0.58
Perceived Seriousness of cervical cancer	5	0.86	0.86	0.56
Barrier Fear of negative outcome	3	0.86	0.88	0.72
Self-efficacy	4	0.82	0.83	0.56
Susceptibility to cervical cancer	3	0.76	0.78	0.55
Barrier Health delivery	4	0.75	0.78	0.48
	24 items (item23 and 38 removed)			
Benefits of VIA	7	0.90	0.91	0.58
Perceived Seriousness of cervical cancer	5	0.86	0.86	0.56
Barrier Fear of negative outcome	3	0.86	0.88	0.72
Self-efficacy	3	0.88	0.88	0.71
Susceptibility to cervical cancer	3	0.76	0.77	0.54
Barrier Health delivery	3	0.79	0.79	0.56

Note: (N = 194), CR, composite reliability, **AVE** Average Variance Extracted

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conducting confirmatory factor analysis with 30 items, which offered valuable evidence about scale stability. We removed a total of 4 items that showed higher covariance in the standardized residual covariance matrices during CFA; item 1 from the perceived benefit factor, item 22 from perceived barrier towards health delivery, item 30 from perceived seriousness and item 39 from perceived self-efficacy. The factor scores for each construct were positively correlated with one another. Each item of the construct was correlated expressively at ≥ 0.5 except for two items (item 23 and 38). EFA was run again and two items were loaded < 0.5; 0.453 and 0.449 for items 23 and 38, respectively. Removing the item improved the model fit. For the study population, item to factor correlation analysis showed that the modified version of HBM with 24 items was a valid model.

The maximum likelihood ratio was used to estimate model fitness and the $\chi 2$ test was used as a measure of fit between the sample covariance and fitted covariance matrices, $\chi 2 = 472.336$, $df = 284$ ($p > 0.05$), normed $\chi 2$ (472.336/284) = 1.663 which is ≤ 3. The GFI was 0.839, and AGFI 0.803, both of which were acceptable ≥ 0.80.

In addition to the X^2 test, other fit indices were used to evaluate model fitness, including the CFI = 0.927 and NFI = 0.833 (≥ 0.90), RMR = 0.060 (≤ 0.08) and RMSEA = 0.059 (≤ 0.06).

These data all demonstrate an acceptable model fit, except for the NIF. All indices were within limits and with significant fit. Generally, tests of the goodness-of-fit of the model were conducted, as summarized by Gaskin, J. & Lim, J. (2016), in the, "Model Fit Measures," AMOS Plugin, and indicated an excellent model fit [29] in Table 4 and Fig 1.

Table 4. Goodness fit indices of the modified HBM for cervical cancer and VIA among health care professionals, Ethiopia.

Measure	Estimate	Threshold	Interpretation
CMIN	396.584	—	—
DF	236.000	—	—
CMIN/DF	1.680	Between 1 and 3	Excellent
CFI	0.937	>0.95	Acceptable
SRMR	0.059	<0.08	Excellent
RMSEA	0.059	<0.06	Excellent
PClose	0.067	>0.05	Excellent

Note: CMIN: Chi-square; **DF**: Degree of freedom; **CFI:** comparative fit index; **SRMR:** standardized root mean square; **RMSEA**: root mean square error of approximation

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Discussion

The HBM has been used in many studies to create measurement tools to identify factors that influence health behaviours across various health conditions and populations. In this study, we evaluated the validity and reliability of a modified HBM for cervical cancer and screening using VIA among female healthcare professionals employed in a large tertiary academic health sciences center. CFA, found that 24 items loaded on six factors. The results revealed that this instrument is suitable to evaluate beliefs regarding cervical cancer screening for a sample of Ethiopian healthcare professionals. Other studies have evaluated the psychometric properties of HBM-related measures associated with HPV vaccination and screening using either exploratory or confirmatory factor analyses to evaluate the factor structures underlying HBM [20]. Most studies retained between 4 and 5 factors which is very close to the findings of the present study in which 6 factors were retained and discrepant with one other study, which yielded a 10-factor structure [30].

The revision of the original 42-item instrument presented here resulted in a shorter yet equally comprehensive basis for measuring HBM constructs. Although the initial 42-item instrument had adequate psychometric properties, the conciseness of the revised version translates into a reduced respondent burden, which may help to enhance survey completion rates in clinical settings. In this case, the instrument was reduced by 18-items (42.9%) with apparently minimal loss of information, if any; however, validation of the reduced instrument in different samples is still necessary and should be the focus of future work.

A few studies have used either exploratory or confirmatory factor analyses to evaluate the factor structures underlying HBM. The subscale reliabilities for these studies varied considerably. Cronbach's alpha ranged from 0.55 in Marlow et al. (2009) to 0.96 in Kahn et al. (2008) and the value for all subscales in this study was 0.806 which is within this range [31, 32]. The internal consistency and reliability of the shortened version of the scale remained strong. The lowest alpha value (0.7) was for susceptibility to cervical cancer, which had only three items. Other psychometric studies of health motivation sub scales have also reported lower reliability using 3-items [20]. The number of items in a subscale has an impact on Cronbach's alpha. Thus, the fact that the lowest alpha was > 0.70 for a subscale with three items is promising, as lower item burden is associated with higher participation compliance. Thus, our data suggest that the reliability of the revised HBM scale for cervical cancer and VIA is acceptable and warrant further testing in other samples of Ethiopian women.

Based on the results of EFA, all questions were clustered in the subscales: benefit of VIA, perceived seriousness of cervical cancer, barrier to fear of negative outcome and health delivery, self-efficacy, susceptibility to cervical cancer and barriers to health delivery subscales. All subscale questions had an acceptable load factor, separately loaded on the related factor. For example, all

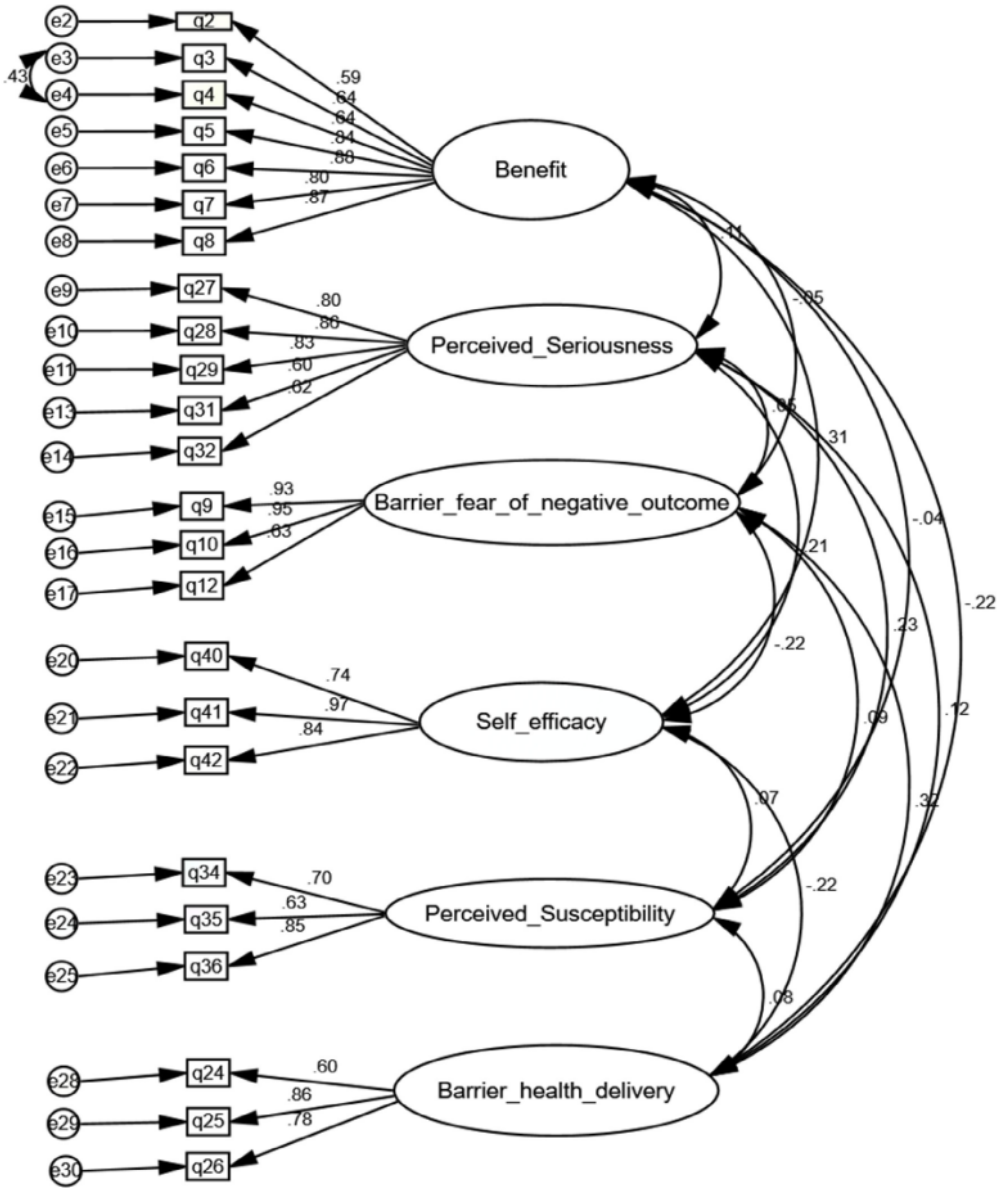

Fig 1. Six-factor structure of modified HBM for cervical cancer and VIA among health care professionals, Ethiopia.

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questions of the self-efficacy scale were loaded on one factor, similar to a method used by authors of a study on the Iranian version of Champion's Revised Health Belief Model Scale for Breast Cancer screening [33]. Decision-making and health behaviour could be influenced by fear theory where it interacts with other components of the HBM to promote healthy behaviour.

According to the results of EFA, three items of the health motivation subscale, namely; question 37, "I eat well-balanced meals for my health; question 38, "I exercise at least three

times a week for my health; and question 39, "I have regular health check-ups even when I am not sick, question 39". Question 37 was unsatisfactory among healthcare providers, consistent with the results of a study of Iranian female students. The remaining two questions were loaded to the self-efficacy factor. Contrary to some previous findings, all items related to the health motivation subscale were loaded on one factor [33].

Under the construct for barrier variables like 'It is difficult to get an appointment for VIA'; so, creating modalities to have short waiting list in the clinicals could be a solution to improve screening practice in the clinical area and enhance early detection to minimize cancer related deaths. As the same time this finding implies for researchers to work on the feasibility of the different screening techniques for cervical cancer like self-testing kits and its efficacy as our finding revealed 'I would be ashamed to lie on a gynecologic examination table and show my private parts to have a VIA' researchers may be interested to look in the feasibility, acceptability of the different screening techniques to optimize screening utilization in the general population the case of Ethiopian women.

Although, there was a difference from the original HBM 42 in the number of items and factor structure, CFA was conducted to assess whether the six -factor EFA measurement was appropriate for the study population. CFA revealed that each item had acceptable loading with its factor. All factors had a good inter-factor correlation and measured similar concepts with acceptable model fit indices.

Study strengths and limitation

A strength of the study was the ability to validate a culturally appropriate modified version of the cervical cancer screening and VIA HBM tool that may be used for future studies among Ethiopian women. There were also several limitations of this study. Due to of the cross-sectional nature of the data used, the stability of the initial and revised dimension scores over time were not examined. Further, data for the present instrument revision were provided by a sample from a specific population, healthcare professionals; hence, the generalizability of the HBM instrument should be examined in other populations of women in Ethiopia, such as those from rural areas and women who are less educated.

Conclusion and recommendations

In conclusion, the revision of the 42-item adapted version of the HBM for VIA instrument provided a validated and more parsimonious short- form instrument (24-items) that, in the available sample of health care professionals, appeared to retain the psychometric properties of the original instrument. Directions for future research include testing the instrument in other populations of Ethiopian women. In addition, future studies may consider adapting the modified HBM scale for VIA to examine perception towards cervical cancer and possible barriers that influences screening behaviours. Assessing the perceptions of women about screening and perhaps helping to evaluate interventions to increase screening in LMICs, such as Ethiopia. Future studies comparing the original 42-item and updated 24 items tool with external measures to support external validity of each construct and subscale will be beneficial and provide greater understanding of the psychometric properties of the tool.

Supporting information

S1 Checklist. Inclusivity in global research.
(DOCX)

S2 Checklist. STROBE statement—Checklist of items that should be included in reports of observational studies.
(DOCX)

S1 File.
(DOCX)

S2 File.
(PDF)

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Original Article

Intention to screen for cervical cancer and factors associated among female healthcare professionals using the trans-theoretical model: Addis Ababa, Ethiopia

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Abstract

Background: Healthcare providers can serve as role models to facilitate a supportive environment that encourages women to utilize screening for cervical cancer. Equally important is that being a female healthcare professional does not prevent the risk of cervical cancer. Therefore, this study aims to assess the intention of screening with visual inspection of acetic acid (VIA) and its determinants among female healthcare professionals (HCPs), guided by the trans-theoretical model (TTM) of stages of behavior change.

Method: A cross-sectional study design was used to test readiness for cervical screening among selected female HCPs. A structured, self-administered questionnaire was used to collect data. The analysis included descriptive statistics and logistic regression.

Result: Four hundred sixty female HCPs with a mean age of M=33.8, ±5 years participated. The intention to participate in cervical cancer screening was 44.1%. Over (half 52% of the participants) had poor knowledge of cervical cancer and screening. Regarding the TTM stages of change, 46.5% of participants indicated being in the pre-contemplation phase, suggesting they had never a VIA screen and had no intention of being screened within the next six months. In the final logistic regression model, four factors, including age, being screened in the past three years, taking care of patients with cervical cancer, and having good to moderate knowledge of cervical cancer and screening, were statistically significant, with large odds ratios for their association with intention to screen.

Conclusions: Most of the participants were in the pre-contemplation phase, and the limited knowledge health workers had about cervical cancer screening is worrisome. Intervening in the factors that affect intention for screening is vital to reducing barriers to cervical screening among female healthcare workers as well as the broader female population in Ethiopia. Providing cancer screening guidelines to all HCPs, regardless of their specialty, could be a key factor in lessening the burden of cervical cancer. [*Ethiop. J. Health Dev*. 2023; 37(1) 000-000]

Keyword: Intention, trans-theoretical model, health care professionals, visual inspection with acetic acid

Introduction

Cervical cancer is a global health concern (1). Worldwide, cervical cancer ranks as the fourth most common malignancy in women, with more than half a million women diagnosed annually and contributing to over 300,000 yearly deaths (2, 3). Approximately 85% of the worldwide deaths from cervical cancer occur in developing countries, and the death rate is 18 times higher in low- and middle-income countries (LMICs) compared with developed countries (3). There are an estimated 7,000 new cases of cervical cancer in Ethiopia annually; with nearly 5,000 deaths reported (4).

Detection of cervical cancer at an early stage is associated with excellent survival, but most women in developing countries present with advanced and often untreatable diseases, with very low survival rates (5). The disease is largely preventable if regular screening is performed. Regular screening is the single most important public health strategy to reduce cervical cancer incidence and subsequent mortality (6). Approximately 90% of cervical cancers occur in LMICs that lack organized screening programs. In high-income countries, cervical cancer incidence and mortality have been reduced by 50% over the past 30 years since the introduction of formal screening programs (2). Despite the negative clinical outcomes associated with cervical cancer in Ethiopia, approximately 27.19 million women are estimated to be at risk. Less than 1% of women between the ages of 18-69 years receive the recommended screening every 3 years, as recommended by the WHO (2014) and adopted by Ethiopia (7-9). Effective, low- resource screenings and treatment methods are recommended in the WHO guideline, which includes using a "see and treat" screening strategy with visual inspection with acetic acid (VIA) as the primary screening method and cryotherapy as a treatment option (10).

Although the importance and effectiveness of cervical cancer prevention with screening are well established, the underlying reasons why the majority of women who are not utilizing available screening services have not been well described. Low levels of awareness and poor knowledge, coupled with a lack of available cervical cancer screening (CCS) services, are likely responsible for a very small number of women being screened (9).

The low prevalence of early cervical cancer screening and limited access to its treatments are largely attributed to differences in diagnosis and subsequent mortality from the disease in low-income countries. Given the poor screening status of women in Ethiopia, calls to address these missed opportunities for CCS

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have been made by responsible stakeholders. Healthcare workers are at the core of efforts to improve screening uptake. Evidence demonstrates that healthcare provider recommendations are a key driver of CCS uptake, especially in situations where an individual's motivation may be inadequate (11). Certainly, healthcare providers, as role models in the healthcare system, are expected to facilitate a supportive environment that encourages women to utilize screening.

Research to date indicates that the availability of screening services alone is inadequate to increase screening participation (8, 12). From a social cognitive perspective, an important implication is that different cognitions may be important at different stages in promoting health behaviors (13). Several theoretical perspectives could be used to explore the determinants of healthcare professionals' behaviors. Consequently, it would be useful to obtain a better understanding of the individual mechanisms of the adoption of new behaviors from social cognitive theories (14). Some behaviors and beliefs may have a significant impact on females' decisions to take preventive actions against cervical cancer (13). Intentions are states in which a person is set to act. Being in the intended state takes one closer to health behavior action (15). To address intention, which changes with time, and to avoid subjectivity, we used the trans-theoretical model to determine the stages of change and intention of cervical cancer screening with visual inspection using acetic acid (VIA). The trans-theoretical model (TTM) of behavior change was used to address the stages of readiness to practice regular cervical screening among female healthcare workers in Ethiopia (16).

Stages of change theory is some of the most important theoretical frameworks that are useful in assessing an individual's readiness to perform a variety ofhealth behaviors, including screening (17). Research demonstrates that intention is a valid proxy measure for behavior among clinicians (i.e., physicians, nurses, pharmacists, and other health workers) (14) . Women can be described as having a series of stages of readiness to practice regular VIA test screening: (a) pre-contemplation: never had a VIA test and any intention to have one within the next 6 months; (b) contemplation: never had a VIA test but intends to have one within the next 6 months; (c) preparation: never had a VIA test but intends to have one within the next month; (d) action: had one VIA test in the past year and intends to continue getting regular VIA tests; (e) maintenance: had regular VIA tests and intends to continue to do so; (f) relapse risk: on schedule, but no intention to get one in the future; and (g) relapse: had VIA tests in the past, none in the last 3 years, and does intend to get one (16).

Health behavior change is associated with changes in self-belief and self-regulatory skills (18). First, in terms of behavioral intentions, research has consistently shown that the intention to perform a behavior can be translated into actual behavior. For example, research indicates the intention to attend cervical or breast screening activities predicts actual attendance (18). Also, understanding the competing and motivating factors affecting CCS behavior among women in the context of Ethiopia helps to enhance screening and treatment efforts. Cervical screening among female healthcare professionals guided by the TTM has not been previously examined in Ethiopia. Researching the intention and looking into pre-existing factors towards the intention of screening among health care professionals at Addis Ababa University College of Health Sciences will contribute to the existing knowledge, bridge the gap to low cervical screening participation, and hopefully lead to a decrease in morbidity and mortality due to the problem. Also, for effective screening and prophylaxis, it is of utmost importance to understand the intention of the healthcare staff, as they constitute an important source for communicating health-related information.

Methods

Study setting

The study took place at the College of Health Sciences (CHS), Addis Ababa University. In the college, there were 3017 permanently employed staff including 913 academicians (683 male and 230 female), 1204 hospital health staff (457 male and 747 female), and 900 administrative staff. The setting was selected as it is the only teaching and health service provision area inclusive of the greatest healthcare professionals to better meet the aim of the study.

Study design

An institutionalbased cross-sectional study design was used to describe the intention of cervical cancer screening among health care professionals working at CHS, Addis Ababa University, used the stages of change described in the trans-theoretical model to determine the pre-existing factors affecting the intention of cervical cancer screening.

Source and study population

All healthcare professionals working in the CHS of AAU were the source populations, and HCPs aged 30 years and older were the study populations.

Sampling Techniques and sample size estimation

The sampling framework for this study was based on participants' profiles obtained from the Office of Human Resources. Samples were proportionally allocated based on the number of female staff available in the units/ departments. Healthcare professionals who fulfilled the inclusion criteria were approached face – to- face and also used the online platforms of the CHS to fill out questionnaires; those who were available and willing filled out the self-administered questionnaire. The sample size was determined using Epi INFO STAT Calc. sample calculation for the population survey; by considering the expected frequency of 25% obtained prevalence of cervical cancer screening practices from a study on cervical cancer screening knowledge and barriers among women in Addis Ababa, Ethiopia (19). Assuming population size of 977, 3% marginal error (d), and a 95% confidence interval, hence n= 440. The total sample size after adding the 10% non-response rate was n = 484. A total of 484 female healthcare professionals, 30 years of age

and older, working at Addis Ababa University (CHS) were included in this study. Students and non-healthcare professionals working in the study setting were excluded from this study. Data were collected from December 2020 to January 2021.

Instrumentation

A structured, self-administered instrument was used to collect data from participants; the instrument was adapted from previous studies. It contains questions about:

***Socio-demographic variables included*:** age, marital status, living arrangements, income, work experience, profession, and level of education.

Medical history and clinical practice: contraceptive use, a history of sexually transmitted disease (STD), history of taking care of patients/family members with cervical cancer, or prior contact with the disease (20).

Lifestyle: age first sexual contact, experience with multiple partners, and sexual activity, history of smoking and alcohol use, condom use, and substance use such as chat chewing (20).

***Knowledge of cervical cancer and screening*:** We used a previously tested tool by Thapa and Oche (2018) with the internal consistency of the questionnaires, where Cronbach's α value calculated was 0.90, to elicit knowledge of cervical cancer and screening. Knowledge about cervical cancer was assessed using 28 items to measure; risk factors (5 items), signs and symptoms (5 items), preventive measures (8 items), and its screening (10 items) were included (21, 22). Out of the 28 items used, some items have multiple responses, hence we scored '1' for each correct response and '0' for the wrong responses. The analysis of the total knowledge score was ranked using Bloom's cut-off point. Good knowledge if it comprises a score of 23-28 (80-100 %), moderate with scores of 16-22 (60-79%), and poor if the score was <16 (<60 %) (23).

Trans-theoretical model (TTM): Women can be described along a series of stages of readiness to practice regular Pap test screening: For this study, the Pap test was presented by VIA as it is widely available and utilized in practice in Ethiopia. To categorize intention, if respondents checked a response among the different stages (contemplation, preparation, action, and maintenance) they were considered to have the intention to screen. If respondents indicated that a response among the different stages (pre-contemplation, relapse risk, relapse), was considered to have no intention to obtain cervical cancer screening (16).

Data Processing and Analysis

Data was entered and cleaned using Epidata software version 3.1 and exported to SPSS version 25 for statistical analysis. Descriptive statistics such as means, standard deviations, and frequencies were calculated. The contribution of the predictors of the outcome variable intent to screen for cervical cancer were examined by performing a logistic regression analysis. Multicollinearity was checked using tolerance and the variance inflation factor (VIF). Variables with a p-value < 0.2 during the bivariate analysis, considering each predictor one at a time, were included in the final model. A multiple logistic regression analysis was computed to consider the conditional effects of factors. Crude odds ratios (COR) were computed for each predictor, one at a time, for the outcome. Adjusted odds ratios (AOR) and 95% confidence intervals (CI) were constructed to measure the strength of association between the intent to screen for cervical cancer and the selected predictors combined in the final logistic regression model. For all statistical tests, a p-value ≤ 0.05 was considered statistically significant.

Ethical consideration

The study received ethical approval from the Institutional Review Board (IRB) of Addis Ababa University with protocol number 017/20/Nursing before participants were approached or data collected. Written informed consent was obtained from all participants, and confidentiality of information was maintained.

Results

Socio-demographic characteristics

A total of 484 questionnaires were distributed to study participants. Twenty-four participants failed to return their questionnaires and were excluded from the study. This resulted in a study population of 460 female healthcare professionals with a response rate of 95% working at Addis Ababa University, CHS. The mean age is M=33.8, ±5.3 years. The majority of the participants were nurses; 281 (61.1%) and 271 (58.9%) had less than 5 years of work experience, as shown in Table 1.

Reproductive health history, lifestyle , and clinical practice of respondents

The mean age of sexual intercourse was M= 21.75, 95% CI [21.26, 22.24]. One undred (21.7%) of the participants had multiple sexual partners. Approximately 33.7% (155), of the study's participants have ever given birth, and over all use of condoms was 68.3% (314). Regarding lifestyle, half of the respondents 230(50%) ever used alcohol. Concerning clinical characteristics only 110(23.9%) participants had ever been screened for CC, and among these 74(67.3%) had received CC screening in the past three years, as shown in Table 1.

Table 1: Socio-demographic, medical history, clinical practice,and lifestyle characteristics of health care professionals working in the College of Health Sciences Addis Ababa University (n=460)

Variable	Category	Frequency	Percent %
Age in Years	30 – 34	323	70.2
M=33.88, SD=5.29	35 – 39	88	19.1
	40 – 44	20	4.3
	≥45	29	6.3
Marital status	Never married	230	50.0
	Married	206	44.8
	Widowed and divorced	24	5.2
Service in years	< 5	271	58.9
M=6.71, SD=6.03	5 -10	126	27.4
	>10	63	13.7
Educational level	BSc	294	63.9
	MD	49	10.7
	MSc and above	117	25.4
Monthly income in Ethiopian birr	<6193	193	42
M=7704, SD=5564	6194–9056	171	37.2
	>9056	96	20.9
Professional stream	Clinical	385	83.7
	Academic	75	16.3
Professional title	Nurse	281	61
	Midwife	39	8.5
	Physician	55	12
	Others*	85	18.5
Unit of work	Oncology	55	12
	Medical-Surgical	356	77.4
	Outpatient	28	6.1
	Others**	21	4.6
Age at first sexual contact n= 411	12 -21 years	218	53
M=21.75, SD=3.455			
	>21 years	193	47
Ever had multiple sexual partners	Yes	100	21.7
Ever use condom	Yes	314	68.3
Ever drink alcohol	Yes	230	50
Ever use the substance (chat chewing)	Yes	28	6.1
Ever smokes cigarette	Yes	28	6.1
Ever used oral contraceptives	Yes	107	23.3
History of STI	Yes	20	4.3
Ever gave birth	Yes	155	33.7
Know someone diagnosed with CC	Yes	113	24.6
Ever taken care of a patient with CC	Yes	153	33.3
Ever been screened for CC	Yes	110	23.9
Screened for CC in the past 3 years	Yes	74	67.3

Knowledge of cervical cancer and screening

The majority 275 (59.8%) of the respondents did not regard "Visual inspection with acetic acid (VIA)" as one of the screening methods for cervical cancer. With regard to screening frequency, the majority (357 (77.6%) and 454 (98.7%) of the participants misidentified it as "every year" and "every 10 years," respectively. Healthcare professionals in this study had a mean knowledge of M=15.63, +SD 3.14, out of a possible range of 0 to 28. Based on knowledge scores, 239 (52%) of the respondents had poor knowledge with regard to cervical cancer and screening. The source of information regarding cervical cancer for more than three-quarters of the respondents 363 (78.7%) was regular course work, and 64 (13.9%) participated in additional training refer to Table 2 and Figure 1.

Table 2: Frequency of correct answers for items about knowledge on cervical cancer among health care workers Addis Ababa University, (n=460)

Items	Frequency	Percent %
Cervical cancer signs and symptoms (0-5) *		
1. No symptoms in early-stage	181	39.3
2. Post-coital bleeding	295	64.1
3. Post-menopausal bleeding	248	53.9
4. Dyspareunia	179	38.9
5. Increased vaginal discharge	193	42
Risk factors (0-5) *		
1. Multiple sexual partners	370	80.4
2. Multiple pregnancies	130	28.3
3. Tobacco smoking	234	50.9
4. Long-term OCP use	191	41.5
5. HPV infection	306	66.5
Prevention of cervical cancer (0-8) *		
1. No multiple sexual partners	325	70.7
2. Avoiding multiple pregnancies	124	27
3. Use of condoms instead of long-term OCP	183	39.8
4. Avoiding early marriage/early sexual debut	133	28.9
5. HPV immunization	367	66.7
6. Regular cervical screening	297	64.6
7. Proper treatment of sexually transmitted infections	251	54.6
8. Treatable if detected early	435	94.6
Cervical cancer screening *		
Available screening test (0-3)		
1. Pap smear test	320	69.6
2. VIA (Visual inspection with acetic acid)	285	40.2
3. HPV (Human papilloma virus) test	251	54.6
Ideal time to screen (0-1)		
1. At the age of 21 or three years after sexual debut	382	83
Screening interval (0-4) *		
1. PAP test: every three years at ages 21-29 years	305	66.3
2. Co-testing (HPV and Pap): Every five years at the age of 30-65 years	315	68.5
3. Pap alone: Every three years at the age of 30-65 years	414	90
4. HPV alone: Every five years at the age of 30-65	341	74.1
Time to stop cervical cancer screening (0-2)		
1. Aged > 65 years with adequate screening history	174	37.8
2. Women who have had a total hysterectomy	122	26.5
Total knowledge score for cervical cancer and screening (0-28)		
M= 15.63, SD=3.14		
Good knowledge (23-28, 80-100%)	18	3.9
Moderate Knowledge (16-22, 60-79%)	203	44.1
Poor knowledge (<16, <60%)	239	52

*Multiple responses were possible, **OCP:** oral contraceptive, **Pap:** Papanicolaou smear test

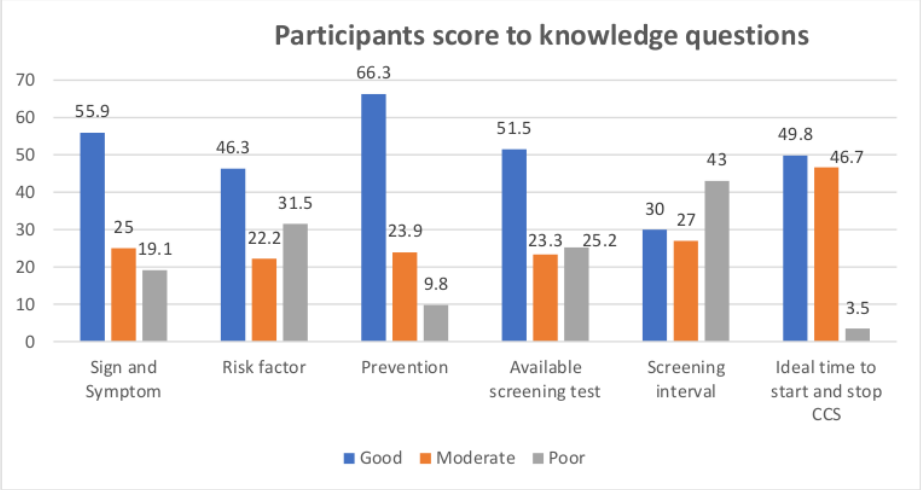

Fig 1: Graphical presentation of participants' knowledge score on cervical cancer and screening

Intention to participate in cervical cancer screening using TTM stages of change

Twohundred-fourteen (46.5%) of the study participants were in the pre-contemplation phase; they had never a VIA and had no intention of having one within the next six months. Of the participants: 76(16.5 %) were in the contemplation phase, 43(9.3%) where in the preparation phase, 39(8.5%) were in action and 45(9.8%) were in the maintenance phase , where participants intended to have screening within six-month, month and continue to get regular screening, respectively. The overall intention among female healthcare professionals was 203(44.1%). More than half 257(55.9 %) of the participants had no intention of screening for cervical cancer, see Table 3.

Table 3: Trans theoretical model stages of change classification on intention to screen for cervical cancer (VIA) among female health care professionals working at Addis Ababa University, n=460

Stages of change	Description	Frequency	Percent %
Precontemplation	Never had a VIA and no intention to have one within the next six months	214	46.5
Contemplation	Never had a VIA but intends to have one within the next six months	76	16.5
Preparation	Never had a VIA but intends to have one within the month	43	9.3
Action	Had one VIA in the past year and intends to continue getting regular VIA	39	8.5
Maintenance	Had regular VIA and intends to continue to do so	45	9.8
Relapse risk	On schedule, but no intention to get one in the future	23	5.0
Relapse	Had VIA in the past, none in the last three years, and does not intend to get one	20	4.3

Factors associated with intention to screen for cervical cancer

In bivariate analysis (considering each factor one at a time relative to intent to screen for cervical cancer), the following factors from socio-demographic items (monthly income, marital status, service year, educational level, age, unit of work, professional stream), reproductive history (oral contraceptive use, history of sexually transmitted infections, ever gave birth, sexual experience status, ever been screened and being screened in the past three years), clinical (know anyone diagnosed with cervical cancer, history of caring for a patient with cervical cancer) and knowledge of cervical cancer and screening showed significance value at p-value < 0.2. In the final logistic regression model, we found that only four of the variables, namely participants' age, being screened in the past three years, taking care of patients with cervical cancer, and knowledge of cervical cancer and screening, had a significant association with intention to screen for CC at a p-value <0.05 shown in Table 4.

Table 4: Factors associated with intention of cervical cancer screening with VIA among health care workers, at Addis Ababa University College of health sciences

Variables	n (%)	Intention to screen for CC		OR (95% CI)		P-value
		Yes	No	COR (95%CI)	AOR (95%CI)	
Age in years						
30-34	323(70.2)	116(57.1)	207(80.5)	.13(.06-.28)	**.084(.021-.342)**	**.001**
35-39	88(19.1)	47(23.2)	41(16)	.13(.06-.31)	**.167(.039-.703)**	**.015**
40-44	20(4.3)	14(6.9)	6(2.3)	.23(.09-.54)	.204(.037-1.84)	.069
≥45	29(6.3)	26(12.8)	3(1.2)	1	1	
Screened in the past three years						
Yes	74(16.1)	67(33)	7(2.7)	17.59(7.85-39.39)	**13.124(5.559-30.984)**	**<.001**
No	386(83.9)	136(67)	250(97.3)	1	1	
Took care of a patient with CC						
Yes	153(33.3)	105(51.7)	48(18.7)	.44(.28-.68)	**3.361(2.074 -5.445)**	**<.001**
No	307(66.7)	98(48.3)	209(81.3)	1	1	
Knowledge of CC and screening						
Good	18 (3.9)	13(6.4)	5(1.9)	6.03(2.07-17.54)	**4.758(1.339-16.906)**	**.016**
Moderate	203 (44.1)	118(58.1)	85(33.1)	3.22(2.17-4.76)	**2.280(1.412-3.681)**	**.001**
Poor	239 (52)	72(35.5)	167(65)	1	1	

CC: cervical cancer, **COR:** Crude Odds Ratio, **AOR:** Adjusted Odds Ratio

Participants in the 30-34- and 35-39-year-old age groups were 91.6 % and 83 % less likely to have the intention to receive screening for CC [AOR (95 % CI) =0.084, (0.021, 0.342)] [AOR (95% CI) = 0.167, (0.039, 0.703)], respectively, compared to those who were 45 years old and above.

The odds of having the intention to screen for CC were 3. 4 times higher among participants who took care of patients with cervical cancer than among those who didn't have a history of care for CC patients [AOR (95% CI) =3.361, (2.074, 5.445)]. Similarly, healthcare providers who have been screened in the past three years were 13 times more likely to have the intention to screen [AOR (95% CI) =13.124, (5.559, 30.984)] than their counterparts who have not been screened.

The odds of having the intention to screen for CC among participants who had good knowledge was 4.8 [AOR (95% CI) =4.758, (1.339,16.906)] and with moderate knowledge were 2 times higher [AOR (95% CI)] =2.280, (1.412,3.681)] than those with poor knowledge.

Discussion

The study found that less than half of the female healthcare professionals surveyed had the intention to undergo cervical cancer screening. Factors that predicted a greater likelihood of those who would undergo CCs included older age groups and previous experience, including those who had been screened in the past three years and previously provided care to a cervical cancer patient., The intention to screen was more likely among those who had better knowledge of cervical cancer and screening.

Intention to be screened for CC was low, with over 50% indicating they had no intention of being screened. The findings are similar to those of a previous study conducted among Ethiopian women whose reported intention for cancer screening was 45.3% (24). Other studies from Southwest Ethiopia attending a gynecology outpatient clinic revealed that only 29.9% had an intention to get screened (25). These findings suggest that CCS rates are exceedingly low in Ethiopia, and whether specialist care improves rates remains an area for further research.

Studies have documented that several demographic factors contributed to the low uptake of cervical screening (26). Results from this study revealed that cervical cancer screening intention was associated with age. The intent of health care professionals in their 30's (30-39 years) had a 99 % lower probability of having VIA screening compared to women 45 years and older. These findings are supported by studies in Nigeria, Botswana, and Addis Ababa, Ethiopia, showing a significant association between the increasing age of respondents and the uptake of CCS (22). A systematic review study conducted in Nigeria among female healthcare providers documented increasing age as a facilitator of screening (27). Study findings from Australia, India, and Ethiopia have also indicated that a woman's age is a major predictor for participating in CCS (10, 28). Older participants were more likely to undergo an annual health check and could seek out and read health promotion material compared to younger participants (29). Exploring age differences in health behaviors is an important step towards understanding preventive practices and future education needs in Ethiopian women. Herbert et al 2008 found that delaying the age of cervical screening increases the risk of cervical cancer becoming more extensive and advanced stage which is more difficult to treat (30). It would seem prudent for regular screening to begin at an earlier age, and attending screening programs may provide an excellent opportunity for education on preventive health care.

It is well established that knowledge does not always translate into behavior, but improved knowledge has been found to increase the rate of cervical cancer screening in most research settings (31). Current research shows health professionals' knowledge is

implicated in screening uptake; those with good or moderate knowledge of CC and screening were more likely to participate in screening. This is supported by a study in Ethiopia showedwomen with better knowledge of cervical cancer and their screening were 2.3 times more likely to utilize screening services than women who were not knowledgeable (10). Cervical cancer screening uptake in Sub-Saharan Africa: a systematic review and meta-analysis; a meta-analysis of seven studies revealed that knowledge about cervical cancer screening was significantly associated with cervical cancer screening (32). Studies conducted in Tanzania and Botswana also found that greater knowledge of cervical cancer and its prevention increased the odds of screening uptake by about 9 and 3 times, respectively (33, 34). Studies carried out in China reported that women who were willing to undergo CCS had higher knowledge levels (35, 36). A study among childbearing women in Ethiopia disclosed that respondents with poor knowledge were significantly less likely to seek preventive health measures or control cervical cancer (37). A systematic review study conducted in Uganda found that adequate knowledge of at least one screening method was significantly associated with having been screened or having the intention to screen (38).

Health providers play numerous roles in the overall well-being of their patients. In addition to assisting with physical needs, healthcare providers offer advice and direction for illness prevention and injury prevention. The low knowledge level of cervical cancer and screening found in this study is surprising considering the profession of the respondents, as they are expected to be more knowledgeable than other women in the community. Training among study participants concerning CC was low and may play an important role in the knowledge gap concerning CCS. Countries wishing to implement new, or strengthen existing, cervical cancer prevention programs must build local capacity to do so. By necessity, these countries generally rely on the in-service training of existing providers, which is the most efficient way to quickly generate sufficient numbers of competent providers (39). In-service training is essential to developing a sense of efficiency and effectiveness in one's capability to engage in health promotive strategies including regular CCS.

Our study found that the odds of having an intention to screen for CC were 3.4 times higher among participants who took care of patients with cervical cancer. A systematic review done in Uganda revealed that having known somebody with CC, or somebody who had undergone CCS was a motivating factor for women to access screening (38). In a study among nurses in Addis Ababa, those who had previously taken care of a patient diagnosed with cervical cancer were two times more likely to practice preventive measures, including routine screening (40). Another study of nurses in Turkey reported there was a significant relationship between utilizing a Pap test and having a family history of cancer ($p< 0.05$) (41). Personal experiences and involvement with CC patients or family members may be a mechanism for increasing screening by having women share their experiences in public or community venues.

Healthcare providers that were screened over the past three years had a 13-fold greater likelihood of intendingn to participate in CCS than those who were not screened. Of note, approximately half of the cervical cancers diagnosed in the United States are among women who were never screened, and an additional 10% of cancers occur among women who were not screened within the past five years (42). Screening for cervical cancer: a systematic review and meta-analysis that pertain to the effectiveness of screening for reducing cervical cancer mortality and incidence, as well as the optimal timing and frequency of screening, highlights A randomized controlled trial in India showed even a single lifetime screening test significantly decreased the risk of mortality from and incidence of advanced cervical cancer compared to no screening (43). The largest immediate gain in reducing the burden of cervical cancer incidence and mortality in Ethiopia may be attained by increasing screening access (regardless of the test used) among women who are currently unscreened or screened less frequently.

In this study, predictors such as level of education, marital status, income, work experience , and sexual experience did not have statistical significance for the intention to screen for CC among healthcare professionals. This might be related to the fact that the majority of studies that came with this result assessed women in general not health care professionals, and it could also be explained by the difference in time and place of the studies conducted.

Conclusions

The findings from this study suggested that the intention to screen for cervical cancer among female healthcare professionals was low in one of the largest academic health science centers in Ethiopia. The observed poor knowledge and low uptake of CCS in our study population of educated female healthcare professionals are of great concern and may potentially hurt the attitudes of the general population of women in Ethiopia towards the utilization of the screening procedure. Since nurses and medical clinicians make up the largest percentage of healthcare providers, their integration and participation in cervical cancer screening approaches are vital for behavioral change. The study findings may also fill agap in the existing knowledge, help policymakers when they make decisions that facilitate their intention to screen for cervical cancer and serve as an important tool to develop comprehensive cervical cancer, prevention programs to increase utilization of screening services. Further research is needed on why female healthcare professionals have a negative view of CCS and if these attitudes incorporate other preventive practices in Ethiopia, such as breast cancer screening and other forms of cancer screening. There needs to be a discussion in communities and at the national policy level on how to best meet the needs of the women of Ethiopia by increasing access to cervical screening.

Conflict of interest
The author(s) declared that they have no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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